

**REPORT**  
**ON**  
**MEDICAL & HEALTH WORK**  
**IN**  
**THE SUDAN**  
**FOR THE YEAR**  
**1934**



12



**REPORT**

ON

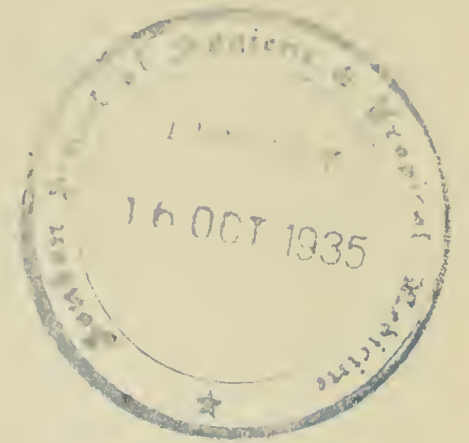
**MEDICAL & HEALTH WORK**

IN

**THE SUDAN**

FOR THE YEAR

**1934**







# ANNUAL REPORT 1934.

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# GENERAL REMARKS.

## GENERAL HEALTH OF THE SUDAN.

With the exception of a severe epidemic of cerebrospinal meningitis in the Nuba Mountains, and sporadic cases in many provinces, the public health of the Sudan remained satisfactory during the year.

The rains were average and well-spaced, with a consequent diminution in the incidence of malaria in the Northern Sudan, particularly in Khartoum district, and the irrigated area of the Gezira.

## HEALTH OF KHARTOUM AND OMDURMAN.

The health of these towns remained satisfactory.

Special measures have been taken to strengthen the antimalarial precautions.

There was a further decline in the incidence of intestinal diseases, other than typhoid fever which showed a slight increase.

The medical inspection of all school-children, and their after-treatment is dealt with systematically. 2,361 medical inspections were carried out, compared with 2,140 in 1933.

It is found that eye diseases form the vast proportion of ailments found and treated. But the incidence of trachoma is rapidly declining, and the percentage of this disease was 27.4 in 1934, compared with 50.3 in 1933.

## HEALTH OF OFFICIALS.

Nationality	Number of Officials employ- ed	Total		Average days' sickness		Died	Invalided
		Placed on sick list	No. of days sickness	For all offic-ials	For those who were sick		
British .. ..	785	146	1047	1.33	7.17	2	2
Sudanese .. ..	3145	610	4916	1.56	8.06	8	7
Egyptians .. ..	575	82	630	1.09	7.68	3	-
Syrians .. ..	42	13	102	2.43	7.85	-	-



The comparative figures for the past four years are as follows :—

YEAR	British			Sudanese			Egyptians			Syrians		
	Days sickness	Died	Invalided	Days sickness	Died	Invalided	Days sickness	Died	Invalided	Days sickness	Died	Invalided
1931	2.46	8	5	1.70	13	7	1.30	1	11	1.10	-	-
1932	2.05	5	5	1.75	5	5	0.84	1	2	0.80	1	2
1933	1.26	2	4	1.65	10	6	1.21	4	1	0.80	-	-
1934	1.33	2	2	1.56	8	7	1.09	3	—	2.43	-	-

Assuming that a British official works for nine complete months in the year, the total number of days lost by sickness in 1934 is equivalent to the loss of 3.8 officials, and compares with previous years as follows :—

<u>1929</u>	<u>1930</u>	<u>1931</u>	<u>1932</u>	<u>1933</u>	<u>1934</u>
16.0	6.3	8.5	5.9	3.6	3.8

The following table shows the number of days lost by officials in various provinces, over a period of four years :—

		N. Bahr el Ghazal	Berber	Blue Nile	Darfur	Dongola	Fung	Halfa	Kassala	Kordofan	Mongalla	Port Sudan and Suakin	Upper Nile	White Nile
British.														
1931	...	3.3	1.1	1.4	2.9	1.8	1.7	0.7	0.8	1.7	1.7	1.8	3.7	1.0
1932	...	2.5	0.64	2.0	0.82	0.42	6.0	—	0.8	3.0	3.1	0.7	3.0	0.4
1933	...	3.0	1.0	2.3	0.9	3.4	3.5	0.55	1.5	2.5	3.8	0.9	1.3	2.5
1934	...	2.0	0.3	1.2	1.8	0.6	2.6	1.4	1.3	0.7	3.3	0.9	2.4	5.2
Sudanese.														
1931	...	1.4	0.4	1.0	0.1	2.0	1.3	1.9	2.9	0.9	6.3	1.7	1.2	2.3
1932	...	1.5	0.4	2.1	2.2	2.2	1.2	0.55	1.3	1.6	2.5	0.4	1.7	1.2
1933	...	3.0	0.7	1.6	1.3	1.4	3.6	1.4	1.2	3.1	2.8	0.3	3.8	2.4
1934	...	2.1	0.6	1.2	3.8	1.1	1.6	1.6	1.8	2.4	4.0	0.9	6.6	1.7
Egyptians.														
1931	...	4.8	0.4	2.2	5.8	0.7	2.3	1.6	0.7	1.0	3.9	0.9	1.0	2.0
1932	...	1.5	0.6	1.2	—	—	0.17	1.0	0.2	0.3	1.0	1.1	1.8	0.8
1933	...	0.55	0.9	1.9	—	—	1.8	0.55	0.9	1.5	2.0	1.8	3.6	1.3
1934	...	2.4	0.6	0.4	1.8	—	3.3	—	1.3	1.1	3.5	0.2	6.0	—

The numbers concerned are too small to enable accurate deductions to be made.

## **ENDEMIC DISEASES.**

### **Ancylostomiasis.**

This disease is no longer a factor of any importance in the northern Sudan. Recent investigations show that it is present in the southern provinces, and in certain districts—notably Rumbek and Wau in the Bahr el Ghazal Province—is a definite menace to public health.

### **Bilharziasis.**

The situation in the irrigated area of the Gezira remains the same. Rectal bilharziasis has been found to have a wider distribution than was formerly supposed, notably in the Bahr el Ghazal and Fung Provinces.

### **Blackwater Fever.**

There has been a decrease in the incidence of this disease, corresponding with the decrease in the malaria rate throughout the central and northern Sudan.

### **Leprosy.**

A scheme has been started to bring the lepers of Darfur, Fung Province and Nuba Mountains under treatment and observation.

As far as is possible, leprosy is dealt with on the lines of any other contagious disease, but where the incidence is high enough to justify special measures these are carried out.

### **Sleeping Sickness.**

Sporadic cases of this disease occurred both in Mongalla and Bahr el Ghazal Provinces. This must be expected, with heavily-infected districts close to our frontiers.

32 cases were reported, compared with 83 in 1933.

### **Tuberculosis.**

The percentage rate for admissions for this disease in 1934, was 1.15 compared with 1.30 in 1933.

## EPIDEMIC DISEASES.

### 1. CEREBROSPINAL MENINGITIS.

4,231 cases with 3,341 deaths were reported during the year.

The incidence for the last seven years is as follows :

YEAR.		Cases.	Deaths.	YEAR.		Cases.	Deaths.
1928	...	335	274	1932	...	532	384
1929	...	464	340	1933	...	166	131
1930	...	865	665	1934	...	4,231	3,341
1931	...	348	240				

#### Kordofan Province.

A severe outbreak occurred in the eastern part of this province during the early months of the year.

The first case was reported at El Obeid on January 9th. Up to March 17th six cases had been diagnosed, of whom 3 died. In the eastern part of the province the first case was reported at Rashad in the Nuba Mountains on March 10th and 7 cases occurred in this village during the following week.

Despite all precautions the disease spread to surrounding villages, and the incidence of the disease increased rapidly.

In all, 1,796 cases with 1,393 deaths, were reported in the Nuba Mountains area before the epidemic died down on the onset of the rains in May.

The inhabitants of the Nuba Mountains live on the slopes and summits of high rocky mountains. Their villages are almost inaccessible, and consist of groups, of small, crowded, badly-ventilated stone huts.

The local housing conditions are ideal for the spread of the disease, and the inaccessibility of the villages makes it difficult for early information regarding outbreaks to be obtained.

In the plains to the north of the Nuba Mountains the first outbreak was at Rahad. The spread was very rapid. Dr. Elliott, Senior Medical Inspector Kordofan, attributed this to the fact that people from surrounding villages—for a considerable distance—water their animals at Rahad, owing to the shortage of water in the surrounding country.

By the end of the epidemic, 164 villages had been infected in this area, and 1,485 cases with 1,163 deaths were reported.

The only other main centre of infection was El Obeid, where 180 cases with 151 deaths were reported.

The total figure for Kordofan was 4,108 cases, and 3,251 deaths.



### Preventative Measures.

As soon as an outbreak was reported in a village, a medical orderly and a policeman proceeded there to establish a quarantine for the sick and contacts, and to persuade the people to evacuate their village and live in the open. As soon as possible a doctor visited the village. All neighbouring villages were warned of the presence of the disease, and told not to have communications with the infected village, to evacuate their own village, and to live out of doors.

In certain areas where the huts were made of grass, it was considered sufficient to pull down the north and south walls so that ventilation was complete, but the inhabitants could remain in them, and take advantage of the shade provided.

The medical orderlies and police visited the village at least once a day to see that they were empty, and to inspect the quarantines and treat the sick.

In El Obeid, additional local restrictions were enforced. They were :—

1. Prohibitions of dances and public assemblies.
2. Religious and other ceremonies restricted to open spaces and only under conditions approved by the District Commissioner.
3. Prohibition of burials without the permission of the Senior Medical Inspector.
4. Drinking shops were closed at 8 p.m.

It was found impossible to stop all movement between villages, but travel by train and car was restricted.

### Aetiology.

The majority of the people affected were of the poor class, but all classes were affected—cultivators, cattle-owners, merchants and labourers.

A measure which contributed effectively to decrease the case incidence in villages was the evacuation of houses by the occupants. Overcrowding, and the close contact which is essential to the rapid dissemination of cerebrospinal meningitis was thus obviated, and an open-air existence substituted, with most favourable results.

In Abbassia (Tegali) which is the largest village in this area, the able and intelligent chief realised the advantages of sleeping out of doors as a valuable prophylactic measure, and ordered—on his own initiative and before the disease arrived—that his people should evacuate their houses. The result was that in spite of the fact that there were heavy infections all round his village, and that Abbassia is a market and a watering centre, very few cases occurred.

Another noticeable feature, and one so far epidemiologically unexplained, was the almost miraculous cessation of cases which coincided with the advent of the rains.

### Statistics.

The case mortality was 79.1%. Analysis of 1,285 cases showed the following age incidence :—

							Cases.
Under 5 years	...	...	...	...	...	...	310
6—10	„	...	...	...	...	...	345
11—20	„	...	...	...	...	...	347
21—30	„	...	...	...	...	...	144
31—40	„	...	...	...	...	...	63
Over 40	„	...	...	...	...	...	76

78% of all cases were under 20 years of age ; 43% of all cases were females, and of these 62.5% were under 15 years of age.

A second epidemic broke out in this province in November, six weeks after the rains had ended.

The first cases were reported from the Heiban District, immediately south of the areas where the first epidemic had occurred.

It spread south to the Kadugli and Talodi districts, and by the end of December 142 cases had been reported, with 99 deaths, and there were 18 centres of infection.

Every effort was made to deal with the outbreak at its onset, and a staff of 250 medical and administrative officials and employees were in action by the end of the year.

It is of interest to note that the case mortality was now 70%, and that the northern boundaries of the area affected in the second epidemic coincided almost exactly with the southern boundaries of the first.

### **Khartoum Province.**

An outbreak occurred in the rural district in May, and was mainly centred on the villages adjacent to Gebel Aulia. There were 89 cases with 67 deaths.

### **Other Provinces.**

A few sporadic cases were reported from Mongalla, Blue Nile, Berber, White Nile, Kassala and Bahr el Ghazal Provinces.

### **General.**

In many parts of the Sudan, housing conditions and overcrowding render the population susceptible to this disease.

When some additional adverse factor, often unknown but sometimes famine or widespread malaria, appears, epidemic conditions prevail.

When an outbreak occurs the only preventative measure of real value is the complete evacuation of villages, or in certain cases the complete reconstruction of houses to ensure thorough ventilation.

Quarantine and limitation of movement also help.

If frequent epidemics of this disease are to be avoided, the housing condition of the people must be improved, and any other adverse factors which may lower their resistance remedied. The problem is being dealt with along these lines.

## **2. DIPHTHERIA**

Sporadic cases were reported as follows :—

						Cases.	Deaths.
Berber Province	...	...	...	...	...	2	1
Blue Nile	„	...	...	...	...	7	1
Darfur	„	...	...	...	...	1	1
Halfa	„	...	...	...	...	11	3
Khartoum	„	...	...	...	...	10	1
Port Sudan	„	...	...	...	...	3	1

Giving a total of 34 cases, compared with 51 in 1933, 138 in 1932 and 183 in 1931.

### 3. INFLUENZA.

This disease was epidemic in the northern Sudan during the winter months. It was of mild type.

A severe outbreak spread throughout Mongalla Province in October and November, with a high mortality rate, particularly among children.

### 4. RELAPSING FEVER.

One case was reported from Malakal during the year.

### 5. SMALLPOX.

The mild variety of this disease reported last year was epidemic during the first six months of the year in the Bahr el Ghazal and Mongalla Provinces.

167 cases were reported in Bahr el Ghazal and 24 in Mongalla Province. There were no deaths.

Four cases of the severe variety, with one death, were reported from Kassala Province. The victims were Arabs who had been infected in Egypt.

Two cases occurred among returning pilgrims in the Suakin Quarantine.

167  
24  
4  
2  
197



## ENDEMIC DISEASES.

### ANCYLOSTOMIASIS.

This disease is of no practical importance in the northern Sudan, where the small foci of infection in Halfa and Dongola Provinces are being dealt with by the dispensaries in the areas concerned.

In the southern Sudan it is a more serious problem.

#### MONGALLA PROVINCE.

It is estimated, as the result of routine examination of stools, that a high percentage of the population is infested.

The disease is discovered by routine examination as very few cases show any signs of the disease.

206 cases were diagnosed in 1934, compared with 62 in 1933. The increase is due to better laboratory diagnosis.

#### BAHR EL GHAZAL.

The disease is prevalent in the northern districts, and in Wau 32% of all cases admitted to hospital harboured the parasites.

880 cases were treated at Wau, 62 at Rumbek and 316 at Tonj, during the year.

### BILHARZIASIS.

The situation regarding this disease remains satisfactory.

It is thoroughly dealt with in all districts where it is possible to attack the snail as well as to treat the human carrier.

In other districts, facilities for treatment are available at dispensaries.

The Kosti and Ducim quarantines were closed down in March as it was impossible to stop a considerable amount of evasion, and it was thought that the sanitary organisation in the Gezira was sufficiently developed to deal with all carriers arriving from the west.

*Schistosoma Mansoni* has been found in the southern part of Fung Province, and in Bahr El Ghazal Province, where it had not previously been diagnosed. It is probable that the distribution of this type of bilharziasis is more extensive than has been believed in the past.

## BLUE NILE PROVINCE (Irrigated Area).

The incidence among the indigenous population remained negligible, with the exception of a small outbreak in Mustapha village in the northern part of the irrigated area, where 16 cases were found during the year.

It was dealt with by a complete medical examination of the village, treatment of those infected, and treatment of the neighbouring canals with molluscicide.

These small outbreaks which occur from time to time show that any relaxation of preventative measures would certainly result in the infection of canals and widespread incidence of the disease.

The systematic re-siting of villages—particularly those inhabited by Westerners—at a minimum distance of 300 metres from the nearest canal, has been completed. This should prevent the indiscriminate fouling of canals, and accordingly reduce the risk of completing the bilharzia cycle. 94 villages have been moved during the year.

At the same time, the sanitation of the Gezira villages has been extended and 21 pit-latrines have been dug in the villages where locally infected cases have been found on the yearly bilharzia survey.

The following figures show that the various precautionary measures have kept the disease under control to date :—

YEAR.				ADULTS.			CHILDREN.			TOTAL.		
				No. Exmd.	No. Infld.	%	No. Exmd.	No. Infld.	%	No. Exmd.	No. Infld.	%
1926	....	....	....	12,734	39	0.3	3,685	37	1.0	16,419	76	0.46
1927	....	....	....	9,431	71	0.75	2,341	37	1.6	11,772	108	0.81
1930	....	....	....	8,783	6	0.07	3,322	20	0.57	12,105	26	0.21
1931	....	....	....	11,102	84	0.75	6,895	51	0.73	17,995	135	0.75
1932	....	....	....	9,618	51	0.53	1,707	19	1.10	11,325	70	0.61
1933	....	....	....	14,188	28	0.2	3,288	27	0.82	17,476	55	0.28
1934	...	...	...	20,124	88	0.44	3,724	8	0.21	23,848	96	0.40

## BERBER PROVINCE.

The increase in the number of dispensaries has enabled treatment to be brought within reasonable reach of the whole population of this province. No other measures are taken in the northern districts.

In the south, every effort is made—both by destruction of molluscs and by examination and treatment—to prevent the disease becoming endemic in the numerous pumping schemes, and to date these have been successful.

In Zeidab a small focus of *S. mansoni* was found last year, and special steps have been taken to deal with it.

In three villages 167 people were examined and 93 (55.7%) were found to be infected.

## DONGOLA PROVINCE.

A bilharzia survey is carried out over the whole of this province yearly, and those found to be infected are treated. In addition, some attempt is made to deal with the mollusc. The incidence of the disease remains low; cases of haematuria are seldom seen and the disease has now become a negligible factor in the public health of the province.



Comparative figures for the past nine years are :—

YEAR.						Number examined.	Infections found.	Percentage.
1926	...	...	...	...	...	20,400	3,550	17.0
1927	...	...	...	...	...	11,376	1,829	16.0
1928	...	...	...	...	...	12,213	2,259	18.0
1929	...	...	...	...	...	17,925	2,187	12.0
1930	...	...	...	...	...	26,094	2,443	9.3
1931	...	...	...	...	...	37,405	1,765	4.6
1932	...	...	...	...	...	49,077	2,470	5.0
1933	...	...	...	...	...	58,711	1,825	3.1
1934	...	...	...	...	...	46,054	1,768	3.8

### HALFA PROVINCE.

The posting of a British doctor to Wadi Halfa, and the completion of the chain of dispensaries, enabled preventative measures to be taken similar to those carried out in Dongola Province. The result of the survey was as follows:—

Examined.	Cases found.	Percentage.
20,180	3,927	19.46

### AGE GROUPS :—

1 to 5	6 to 10	11 to 15	Over 15	Undefined.
522	808	1,299	1,107	191

Treatment was completed in 3,506 cases, leaving 421 still undergoing treatment at the end of the year. It is expected that a steady reduction in incidence will be shown in future years as a result of systematic treatment and anti-mollusc measures.

### WHITE NILE PROVINCE.

12 wells were dug in infected villages to provide an alternative water supply to the river or to water holes, both of which are potent sources of bilharziasis in this province. These have proved remarkably successful in the past, and there is every reason to believe that they will result in a considerable reduction in the incidence of bilharziasis in these villages.

The programme will be completed in 1935.

The following table shows percentage rates of infection by rectal bilharzia among school boys :—

			1926	1930	1931	1932	1933	1934
Ed Dueim	...	...	93	25	18.3	13	9.4	13.3
Kawa	...	...	100	24	16.0	14	0.0	0.0
Geteina	...	...	90	47	17.3	13.3	0.5	0.0
Aba Island	...	...	54	14	9.0	2.4	6.8	11.3



## KORDOFAN PROVINCE.

The incidence has decreased appreciably in most districts as the result of extensive treatment. The disease is of a mild type, as infection can only take place during the limited period when the water holes are functioning.

# BLACKWATER FEVER.

34 cases with 9 deaths were reported. Of these 32 cases with 8 deaths occurred in hospital.

The figures for the last five years are as follows :—

[illegible]

The race incidence for 1934, in relation to the 12th parallel of north latitude, was as follows :—

						North of 12th parallel		South of 12th parallel	
						Cases.	Deaths.	Cases.	Deaths.
Italian	...	...	...	...	...	—	—	4	—
Greek	...	...	...	...	...	—	—	1	—
Syrian	...	...	...	...	...	2	2	2	—
Egyptian	...	...	...	...	...	1	—	—	—
West African	...	...	...	...	...	—	—	1	—
Sudanese Arab	...	...	...	...	...	11	4	9	2
Sudanese Negroid	...	...	...	...	...	—	—	3	1
TOTAL						14	6	20	3

The percentage of cases occurring south of the 12th parallel for the last three years is as follows :—

									<u>Per cent.</u>
1932	...	...	...	...	...	...	...	...	59
1933	...	...	...	...	...	...	...	...	60
1934	...	...	...	...	...	...	...	...	59

## DRACONTIASIS.

This disease is endemic in the southern Sudan.

### MONGALLA PROVINCE.

A large number of cases still report for treatment, but the numbers are steadily decreasing as a result of extensive propaganda regarding prophylactic measures. 482 cases were treated during the year.

The chiefs' dressers assist in the prevention of the disease.

### BAHR EL GHAZAL PROVINCE.

169 cases were treated.

### UPPER NILE PRVOINCE.

217 cases were treated.

## DYSENTERY.

2,823 cases were admitted to hospital of whom 2,578 were amoebic and 245 bacillary.

There has been a decrease in the incidence in Kassala town where the sanitary staff has been augmented recently. The comparative figures are as follows:—

							Amoebic.	Bacillary.	Total.
1933	...	...	...	...	...	...	80	151	231
1934	...	...	...	...	...	...	74	1	75

Special attention was paid to this town owing to the high incidence of bacillary dysentery in recent years.

It is of interest to note that Malakal reported 56 cases compared with 85 in 1933. The sanitary services have also recently been augmented in this town.

The following table shows the admissions to hospitals for each of these two diseases given as the percentage of the total admissions for all causes for 1934 and the preceeding seven years :—

				1927	1928	1929	1930	1931	1932	1933	1934
Amoebic Dysentery	...	...	...	3.29	3.40	3.02	2.68	3.28	2.51	3.25	3.00
Bacillary Dysentery	...	...	...	1.21	0.80	0.75	0.37	0.41	0.41	0.38	0.28
TOTAL	...	...	...	4.50	4.20	3.77	3.05	3.69	2.92	3.63	3.28

## HYDATID DISEASE.

This disease only occurs in the Kapoeta district of Mongalla Province, where 24 cases were reported, as compared with 13 in 1933.

## KALA-AZAR.

The geographical distribution of this disease remains the same. The main endemic centres are along the Sudan Abyssinian border, but sporadic cases occur in all parts of the central and western Sudan.

Investigations regarding its etiology are at present being carried out in Fung Province by the Director, Wellcome Tropical Research Laboratories, in collaboration with Dr. Henderson, the Senior Medical Inspector in charge.

### KASSALA PROVINCE.

17 cases were diagnosed in Kassala district, compared with 21 cases in 1933 ; and 8 cases in Gedaref district, compared with 22 in 1933. Many of the Kassala cases were of foreign origin, and six were infected in Khor Baraka of Eritrea.

### FUNG PROVINCE.

121 cases were reported, compared with 61 last year. The special work carried out in this district during the year has led to increased activity on the part of the whole province medical staff in its detection.

The following have been treated in hospital :—

ADULTS.		CHILDREN.		TOTAL.	
Male.	Female.	Male.	Female.	Male.	Female.
55	8	18	11	73	19

The nationality of these cases is as follows :—

Arab	...	...	...	...	...	...	...	...	48
Negroid	...	...	...	...	...	...	...	...	40
Fellata	...	...	...	...	...	...	...	...	2
Mawallad	...	...	...	...	...	...	...	...	1
Abyssinian	...	...	...	...	...	...	...	...	1
TOTAL									92

Dr. Henderson makes the following observations :—

Of the 121 cases at least 80% definitely contracted the disease locally, *i.e.*, in villages situated along the Blue Nile, or its subservient khors between the parallels 11.15, and 13.45. A few cases occurred on the Dinder, and most of the remainder were probably infected about Gedaref.



Thus the disease must be endemic in villages along the river, and contrary to popular belief is not necessarily being continually introduced from Abyssinia, though it may possibly have originated from this source.

The age incidence of the disease, as appears in hospital returns, is decidedly misleading. The infection is fairly well recognised by the native of these parts, and when a child is considered infected, the parents rarely think it worth while taking him to hospital, as the disease is considered almost universally fatal in children.

From personal observation in the infected area, it would appear that :—

1. The disease is most prevalent during the dry season.
2. The majority of cases occurring just after the rains are adults.
3. Children are mostly affected towards the end of the dry season.
4. Infections in children out-number those in adults.
5. General resistance to the disease is extremely low in both adults and children.
6. The disease is practically always found in filthy surroundings, especially inside the house.
7. Cohabitation with dogs, goats, and chickens does not of itself increase the incidence of the disease.
8. A familial incidence of the disease is fairly common.

The following points in the symptomatology of the disease have been noted:—

1. Incubation period probably several months.
2. Onset insidious, commencing with remittent fever which, though high, causes little apparent incapacitation.
3. Symptoms referable to involvement of the upper respiratory tract, such as nose bleeding, occur after the fever has been present for at least one month.

Detailed clinical observation of cases in hospital show :—

1. Double rise of temperature in 24 hours almost always present.
2. A rapid pulse persisting during the apyrexial period, *e.g.*, pulse 120, temperature 100.

Differential blood counts have been carried out in 30 cases, on admission and during treatment, and results have shown that this examination may be an important factor in prognosis. Cases on admission with a lymphocyte count of below 20% rarely recovered. If the lymphocyte increased during treatment the prognosis was usually good, and alternatively if they decreased a fatal termination was presaged.

Concomitant infections with malaria, bilharzia, amoebic dysentery and taenia were frequently observed, especially malaria.

Reaction to treatment was better than last year, and approximately 60% of apparent cures were affected. Neostibosan was the drug usually employed in hospital, but cases which did not react after six injections were immediately switched on to a full course of 25 grains of Sodii Antim. Tart. Also, cases showing any rises of temperature after completing the course of Neostibosan were similarly treated. This was done because some of the cases discharged “cured” in 1933 were found to have relapsed and died, several months after returning to their own villages.

Sequelae—Necrosis of the bone of jaw and upper nasal passages has been encountered. One child made an apparently complete recovery after excision of an extensively necrosed right lower jaw. Several cases of residual deafness have been seen, through probable extension of infection along the Eustachian tubes.

Prophylaxis—Cleanliness of both person and surroundings goes a long way in preventing infection.

No fresh cases have so far occurred among the indigenous population of Dar Agil, but it is still too early to say if the intensive treatment carried out there has completely killed off infection.

**UPPER NILE PROVINCE.**

Progress has been made in obtaining the confidence of the primitive inhabitants of the Paloich endemic area, with the result that 24 cases—with 6 deaths—were reported, compared with 7 cases last year.

**MONGALLA PROVINCE.**

86 cases—with two deaths—were reported in the Kapoeta district, compared with 58 cases last year. Increased confidence in medical work accounts for this increase, and 56 out of the 86 cases were children.

				1933		1934	
				Male.	Female.	Male.	Female.
Admissions	...	...	...	42	16	58	28
Deaths	...	...	...	3	1	1	1

**DARFUR PROVINCE.**

Seventeen cases were diagnosed, 15 in El Fasher, 1 in Nyala, and 1 in Buram.

**CONCLUSION.**

Under normal conditions the disease is not of importance. The incidence seems to have a direct relation to the standard of living and housing, and is higher in times of stress and famine. As it is endemic in districts adjacent to the irrigated area of the Gezira, it might easily become a serious menace if malaria or bilharziasis became so prevalent in this region that the resistance of the people was considerably reduced. Under present conditions, this is unlikely.



## DISTRIBUTION.

The following list shows the number of cases occurring in the separate endemic areas, shewn as male, female and children under 15 :—

PROVINCE.	DISTRICT.	ADULTS.		CHILDREN.		Total.
		Male.	Female.	Male.	Female.	
Kassala ... ..	Kassala Gedaref	15 6	— —	1 2	1 —	17 8
N. Fung ... ..	Singa Sennar	23 14	4 1	11 7	6 3	44 25
S. Fung ... ..	Roseires	21	5	15	11	52
Blue Nile ... ..	Wad Medani Abu Usher	5 1	— —	— —	— —	5 1
Darfur ... ..	Fasher Nyala Boram	12 1 1	— — —	3 — —	— — —	15 1 1
Bahr el Ghazal ...	Wau	1	—	—	—	1
Berber ... ..	Atbara	1	—	—	—	1
Khartoum ... ..	Khartoum	5	—	—	—	5
Mongalla ... ..	Kapoeta	18	12	40	16	86
Port Sudan ... ..	Port Sudan	1	—	—	—	1
Upper Nile ... ..	Paloich	6	2	8	8	24
	Doleib Hill	1	—	—	—	1
White Nile ... ..	Dueim	1	—	—	—	1
TOTAL ... ..	... ..	133	24	87	45	289

## LEPROSY.

Efforts are now being made to deal with this disease in all parts of the Sudan. The present situation is as follows :—

The only districts where it is a serious public health problem are the southern districts of the Bahr el Ghazal and Mongalla Provinces.



## **MONGALLA.**

8 years ago all the lepers in the sleeping sickness areas (1039) were brought into settlements. The population was under frequent medical inspection for Sleeping Sickness, so there was little difficulty in collecting all of them. Since then 472 have been discharged and 137 lepers have been admitted or readmitted.

It is early to make deductions, but it seems evident that as all the infectious lepers are in settlements, and as comparatively few new cases are diagnosed in the routine sleeping sickness inspections of the whole population, the measures taken have been effective to date.

This satisfactory result is attributed to the fact that the whole population has been under constant medical observation for many years so that there was no difficulty in isolating all the infectious lepers in the first instance.

In the northern part of the province Pini leper settlement deals with the part west of the river. A new settlement east of the river at Koggi has been opened this year to deal with the small number of lepers who live on that side.

It should be noted that these settlements are really villages of lepers who live near enough to a dispensary to be supervised, and are given special facilities for cultivation.

## **BAHR EL GHAZAL.**

In the Bahr el Ghazal the situation is not so satisfactory. Although as many lepers as possible were brought into the Yambio and Tembura settlements in 1927, and at the present time nearly all infectious lepers are under observation and treatment in these settlements, many fresh cases are still diagnosed in the outside districts.

It would appear that leprosy exists in this area under optimum conditions, and something more than the routine methods is required here. As has been mentioned in previous annual reports, diet is probably the greatest factor. The Zande tribe—who inhabit this area—are meat and milk starved as, owing to tsetse fly, cattle do not exist. It is a formidable undertaking to change the diet of a tribe, but an experiment is at present being carried out in introducing a large number of goats in the hope that—under supervision—the meat starved inhabitants may restrain their inclination to eat them, and be content with their milk until the herds multiply and have become established. In addition, a few cattle which are relatively immune to fly have been introduced from the Koalib Hills in the Nuba Mountains.

### **Li Rangu Leper Settlement.**

Dr. Woodman, Medical Inspector in charge of the settlement, reports as follows :—

There are 1,156 lepers now under treatment at Li Rangu, and a small number discharged from treatment, but under observation. The progress of the former is analysed in the following tables. There is more reward for the first two years of treatment than for the subsequent period of equal length, although the balance is quite clearly in favour of treatment with chaulmoogra derivatives for all but the advanced nodular and cutaneous cases. These latter are discussed in the commentary and conclusion.

TABLE I.

Analysis of 887 non-segregated, relatively early cases  
under treatment.

TYPE.			Completely cleared.	Much improved.	Improved.	Quiescent.	Worse	Total.
C.1	...	...	20	63	62	197	2	344
C.2	...	...	—	21	26	134	26	207
N.1	...	...	7	30	17	61	9	124
N.2	...	...	—	—	8	51	11	70
C.1 N.1	...	...	2	7	13	30	5	57
C.1 N.2	...	...	—	—	5	14	7	26
C.2 N.1	...	...	—	—	1	4	4	9
C.2 N.2	...	...	—	7	6	17	20	50
TOTAL			29	128	138	508	84	887

“Quiescent” where there are no outward signs of change in the neural or cutaneous type of the disease.

The following is a copy of table in 1932 Annual Report for comparison with the above figures :—

TYPE.			Much improved.	Improved.	In statu quo.	Worse.	Cured	Total.
C.1	...	...	87	134	108	18	36	383
C.2	...	...	29	49	87	25	1	191
C.3	...	...	—	1	1	6	—	8
N.1	...	...	35	34	33	11	21	134
N.2	...	...	6	13	20	16	1	56
C.1 N.1	...	...	20	22	28	23	1	94
C.1 N.2	...	...	1	1	6	10	—	18
C.2 N.1	...	...	10	4	13	25	—	52
C.2 N.2	...	...	5	15	14	23	1	58
C.3 N.1	...	...	—	4	5	11	—	20
C.3 N.2	...	...	1	2	10	11	—	24
TOTAL			194	279	325	179	61	1038

TABLE 2.

Analysis of advanced lepers in a segregated area.

TYPE.			Much Improved.	Improved.	Quiescent.	Arrested.	Worse	Total.
C.2	...	...	—	—	1	—	1	2
C.3	...	...	—	—	—	—	8	8
C.2 N.1	...	...	1	1	1	—	2	5
C.3 N.1	...	...	1	2	3	—	13	19
C.3 N.2	...	...	—	1	3	—	34	38
N.2	...	...	1	3	33	16	13	66
C.1 N.2	...	...	1	3	6	—	16	28
C.2 N.2	...	...	—	4	3	—	3	10
TOTAL			4	14	50	16	92	176

“ Arrested ” where the case is quiescent over a period of more than two years.

NOTE.—From “ arrested ” to “ worse ” in spite of continued treatment									7
Mixed type. The Cutaneous improved (often markedly), but the									
neural was worse in									21
Died									7

SUMMARY OF TABLES 1 AND 2.

	Improved.	Quiescent.	Arrested.	Cured. *	Worse.
Early Cases :—C 1 ; C1-2 ; N1 ; C1 N1 ; C1-2 N1	244 (32.2%)	436 (57.5%)	— —	29 (3.8%)	49 (6.5%)
Advanced cutaneous C2-3 ; C3	—	1 (10%)	—	—	9 (90%)
Mixed cases — excluding C1-2 N1...	28 (17.6%)	37 (23.3%)	—	—	94 (59.1%)
Neural—excluding N1	12 (8.8%)	84 (61.8%)	16 (11.8%)	—	24 (17.6%)

\* Under observation.



TABLE 3.

Analysis of 639 early cases not under treatment.

STAGE.	Improved.	Quiescent.	Arrested.	Worse.	Completely cleared.
C.1 ... ..	79	65	31	19	34
C.2 ... ..	29	3	5	10	—
C.1 N.1 ... ..	20	5	8	5	—
N.1 ... ..	29	10	6	8	—
Goose skin only ...	120	45	32	23	53
TOTAL ... ..	277	128	82	65	87
Percentage ...	43.35	20.03	12.83	10.17	13.62

#### Commentary.

Comparison between the 1932 table and Table 1 indicates that a high percentage in all categories have been brought to a stage of quiescence. The figures in the other columns show much the same percentage change in both, with the exception of the type C.2 N.1. The number in this column has greatly decreased probably indicating that this is the most active type of the earlier stages, and one in which the disease is less frequently arrested.

The C.3 N.2 column, on the other hand, the most advanced stage of the disease, shows a considerable increase.

The summary table is not very encouraging. It brings home the fact that the prognosis for nodular cases is as melancholy as ever. Whereas two years ago it could be claimed that 15% of C. 3, C.3 N.1, C.3 N.2 cases improved, the percentage in the last two years is considerably less than that. As far as the Central African form of these stages is concerned, it cannot be said that any chaulmoogra derivative holds out much prospect of success.

Rations of 4 ozs. of lulu oil, fat, simsim or palm oil have been issued with extra ground nuts twice weekly, and dried meat—when obtainable—to segregated cases.

Much is now claimed for intravenous methylene blue therapy, and this is being tried out on all nodular cases. Analysis of early cases not under treatment (Table 3) shows an even greater percentage improved, while the number worse are about the same, but the number quiescent is more than three times as great among those who are under treatment. It must be borne in mind that these are such early cases that the diagnosis is in some instances doubtful; and that the phenomenon of “goose skin” is not always pathognomic of leprosy.

Much routine laboratory work is necessary—notably M. leprae examinations, erythrocyte sedimentation indices, and skin sections—before one can reap conclusive evidence upon the foregoing data.

**Conclusion.**

Consideration of the above tables confirms that treatment of all but the advanced cutaneous and nodular cases with chaulmoogra derivatives meets with some definite measure of success.

That of these latter drugs, intramuscular sodium gynocardate has been found to be the least painful and most effective.

That the attempt to improve the standard of living with vegetable and animal fats for segregated cases has been disappointing. It cannot be said visibly to have influenced the course of the disease.

That (1) the removal of all cases in an “infective” stage from the remainder of the tribe, and (2) the encouragement of any factors which make for an improvement in the general standard of living are the most important points in eradicating the disease.

**Tembura Leper Settlement.**

An average of 400 lepers were in the settlement during the year. Sixty persons were discharged at the beginning of the year, apparently cured.

The number of cases in the various categories at the end of the year was :—

Cutaneous.	Nervous.	Mixed.
197=56%	2=0.5%	153=43.5%

The progress during the year was as follows :—

TYPE.			Number.	Better.		Stationary.		Worse.	
C.1	...	...	116	38	32.8%	76	65.5%	2	1.7%
C.2	...	...	82	30	36.6%	50	70.0%	2	2.4%
C.1 N.1	...	...	45	9	20.0%	35	77.8%	1	2.2%
C.2 N.1	...	...	38	4	10.5%	26	68.5%	8	21.0%
C.1 N.2	...	...	10	—	—	5	50.0%	5	50.0%
C.2 N.2	...	...	59	—	—	16	27.0%	43	73.0%
N.1	...	...	1	—	—	—	—	1	100.0%
N.2	...	...	1	—	—	—	—	1	100.0%

**Segregated Lepers at Bakango.**

The average number during the year was 130 :—

Male	Female	Children
64	37	19

Their classification at the end of the year was as follows :—

TYPE.				Improved.	Stationary.	Worse.	Total.
Cutaneous...	...	...	...	2	2	1	5
Nervous	...	...	...	—	1	—	1
Mixed	...	...	...	6	54	30	90



### Wau Settlement.

	Remaining 1-1-34	Admitted.	Discharged.	Died.	Remaining 31-12-34
Men ... ..	25	13	2	5	31
Women ... ..	23	3	1	—	25
Children ... ..	1	—	—	—	1

### FUNG PROVINCE.

A settlement has been opened near Singa to deal with the northern part of the Province, and one near Roseires for the southern districts. They are supervised by the respective hospitals.

### KORDOFAN PROVINCE (Nuba Mountains.)

Settlements are being formed near dispensaries, and it appears that the incidence is higher than was previously supposed.

367 cases have been treated during the year, of which 271 showed signs of improvement.

### DARFUR.

The Darfur campaign against leprosy has progressed rapidly, and treatment is popular with the natives. It has been surprisingly effective in this province. 87 fresh cases were under treatment during the year.

### NORTHERN SUDAN.

The incidence of the disease is so low that it is of little public health importance. All lepers are kept under observation, and the leper colony at Gedaref deals with cases which cannot be treated locally.

As far as possible, leprosy is dealt with in common with other diseases, and no undue emphasis is laid on its importance. In general it certainly takes second place to tuberculosis, and in all parts of the Sudan—except in the extreme South—to malaria or syphilis. Obviously in the southern districts, special attention must be given to the disease. On the whole, the situation is well in hand.

## MALARIA.

The rains were average and well-spaced in the northern Sudan, and the incidence of malaria was low.

In Berber Province the exceptionally high flood left ideal conditions for mosquito breeding and the consequent outbreak of epidemic malaria. The Sanitary and Medical organisation, which has been considerably strengthened in this province in recent years, managed to deal with the situation satisfactorily, and the incidence of the disease was not appreciably raised.

### GEZIRA.

Malaria is by far the most important endemic disease in the Gezira, and special efforts were made this year to ensure that as far as possible breeding places of mosquitoes were eliminated.



Village borrow-pits were filled in, and never before have been there so few collections of water in the villages.

Many miles of trenches alongside the railway lines, disused scour-pits, and other unnecessary depressions due to the minor canalisation, were also effectively dealt with. Special attention was paid to gardens in the irrigated area to reduce shelter for mosquitoes.

The baling of the field channels showed a marked improvement.

The oiling of the scour-pits in use was carried out over the whole Gezira, and was found to be as effective as the baling which was enforced in previous years. It relieved the cultivator of an unpleasant task, which was definitely unhealthy in the cold weather.

It is hoped to extend this oiling to the field channels next year.

There was a reduction in the number of cases reporting sick with malaria, and the spleen counts on schoolboys showed a corresponding diminution. It is difficult to say how far this was due to additional precautions taken, as climatic conditions were adverse for malaria throughout the northern Sudan.

Experiments were carried out:—

1. To eliminate the gametocyte carrier,
2. To control mosquito breeding in the field channels from the time of sowing until baling became practicable.

In the first experiment, all the children in one block were given plasmochin twice a week from October 1st until January 31st.

The work previously carried out by the malariologist had indicated that children were by far the most common gametocyte carriers, that plasmochin in small doses twice a week removed the gametocytes from the peripheral blood, and that human carriers were practically restricted to these months. The experiment has not yet been completed, and no figures are yet available to enable it to be assessed.

In the second experiment the field channels of the cotton numbers in two blocks were oiled from the first watering about the end of July until September 15th when baling is enforced. It was found that the number of pools infected with mosquito larvae in the control block was four times that of the oiled blocks.

It is intended to extend this experiment considerably during the next rainy season.

## **GENERAL.**

The situation as regards malaria has improved considerably within recent years. Formerly, epidemics of acute malaria swept over the northern and central Sudan periodically, with heavy loss of life. The establishment of the dispensary system, to the number of 300, with their ancillary services of sanitary barbers and sheikhs' dressers, has brought treatment within a reasonable distance of all. Consequently, if malaria occurs in any district, the sick are treated at once.

On the preventative side every effort is being made to ensure—by sanitary measures and propaganda—that the number of mosquitoes is reduced to a minimum, and persons suffering from chronic malaria are put under a full course of treatment.

As regards the irrigated areas of the Gezira, dispensaries are thickly distributed, and there is no doubt that acute epidemic malaria has been eliminated as in other areas.

As regards chronic malaria, the large sanitary staff of the Gezira manage to keep it under reasonable control. Malaria, as would be expected, is higher in these areas than in the surrounding desert country, but the situation is improving year by year as sanitary precautions improve by experience. Taking into account the facilities for mosquito breeding and malaria that an irrigation scheme of this kind provides, the situation in the Gezira is well under control in this respect.

As regards the Gash, where the problem is easier owing to the limited period of the year when irrigation takes place, the situation has improved during the last few years owing to massed treatment and intensive antimalarial work.

In the southern Sudan, malaria is still widespread, and it is probably one of the principal causes of infantile mortality. In adult life the natives show a very high immunity to the disease. Here the situation is dealt with by a network of dispensaries which provide adequate facilities for treatment. In the towns, the usual antimalarial precautions are carried out.

The following table gives the available information as to the incidence of the three types of malaria throughout the Sudan :—

PROVINCE.	January	February	March	April	May	June	July	August	September	October	November	December	Total
Benign Tertian.													
Berber ...	77	22	8	9	13	3	20	3	5	9	6	7	182
Blue Nile	30	34	12	15	9	5	8	33	42	63	61	69	381
Darfur	4	2	1	1	—	—	11	51	59	39	15	1	184
Dongola	3	1	4	2	1	3	—	2	2	—	2	—	20
Fung	35	15	25	30	12	16	38	56	68	60	42	19	416
Halfa	5	4	3	3	2	2	3	1	4	2	—	—	29
Kassala	28	17	12	10	23	37	28	39	45	116	34	14	403
Khartoum	25	26	18	17	11	11	12	20	27	22	15	15	219
Mongalla	1	—	—	5	5	10	7	12	15	9	11	7	82
Port Sudan	—	—	—	—	—	—	—	—	—	—	—	—	—
Upper Nile	3	2	1	1	1	1	—	2	—	1	1	—	13
White Nile	40	70	60	49	26	11	36	93	199	113	76	46	819
Malignant Tertian.													
Berber ...	13	8	2	3	6	2	6	3	1	2	5	5	56
Blue Nile	60	24	23	26	10	11	60	117	37	51	69	53	541
Darfur	3	5	3	2	1	1	10	23	24	23	4	3	102
Dongola	12	9	1	—	4	1	2	2	—	1	—	1	33
Fung	72	50	53	42	10	6	22	34	112	108	97	32	638
Halfa	—	—	—	—	—	—	—	—	—	—	—	—	—
Kassala	3	—	—	—	4	3	9	9	43	87	24	4	186
Khartoum	27	27	12	14	13	13	14	13	19	17	8	18	195
Mongalla	36	12	25	64	110	71	89	94	133	174	117	56	981
Upper Nile	54	130	72	67	31	46	40	22	46	66	48	60	682
White Nile	42	19	17	2	2	3	11	43	42	48	21	7	257
Quartan.													
Berber ...	—	6	—	2	—	—	—	—	1	1	1	—	11
Blue Nile	—	3	1	3	2	1	2	—	—	5	3	1	21
Fung	14	2	10	5	8	2	2	5	—	—	2	6	56
Kassala	1	2	—	—	—	—	3	—	—	—	—	—	6
Khartoum	—	1	—	—	—	—	—	—	—	1	2	1	5
Mongalla	—	—	—	1	—	—	1	2	2	3	3	—	12
Upper Nile	1	1	—	1	1	—	2	—	—	—	1	6	13



## PELLAGRA.

Diet deficiency is very common during the dry season among the nomad tribes in the northern Sudan. Pellagra is probably commoner than is reported among these people.

## RABIES.

Rabies is endemic in the central and northern Sudan.

8 human cases were reported.

198 persons received prophylactic treatment, and of these 6 died of the disease.

Details of the fatal cases are as follows :—

(1) A woman died soon after admission to hospital.

(2) A boy died 30 days after the bite, having received a full course of injections.

(3) A girl died 37 days after the bite, having received 8 injections.

(4) A child died 25 days after the bite, having received a full course of injections.

(5) A man died 39 days after the bite, having received a full course of injections.

(6) An old man died 5 weeks after the bite, having received a full course of injections.

(7) & (8) A child and a boy died untreated. They were not seen by the Medical Inspectors. In the latter case 50 days are reported to have elapsed between the bite and the occurrence of death.

Government officials are prohibited from keeping dogs in Darfur Province, and in parts of Kordofan and Kassala Provinces where the disease is particularly prevalent.

The numbers of dogs is kept as low as possible. Wild animals, particularly hyenas and jackals, act as reservoirs of the disease, and as these are difficult to destroy it is only by constant vigilance that the disease can be kept under control.

## ACUTE RHEUMATISM.

374 cases of this disease (with no deaths) were reported, as against 351 cases (with 2 deaths) in 1933. The distribution of the cases was :—

PROVINCE.			Cases.	PROVINCE.			Cases.
Bahr el Ghazal	...	...	41	Kassala	..	...	31
Berber	...	...	11	Khartoum	...	...	49
Blue Nile	...	...	59	Kordofan	...	...	42
Darfur	...	...	71	Mongalla	...	...	34
Dongola	...	...	17	Port Sudan & Suakin	...	...	10
Halfa	...	...	7	White Nile	...	...	2



## SCURVY.

52 cases were reported with 3 deaths.

## SLEEPING SICKNESS.

32 cases were reported compared with 83 in 1933.

### BAHR EL GHAZAL.

The total number of cases reported was 22 compared with 82 in 1933.

The following list shows the number and distribution of cases since 1918 :—

Year	Tembura	Yambio	Year	Tembura	Yambio
1918	255	—	1926	79	—
1919	621	—	1927	49	3
1920	192	—	1928	26	2
1921	656	—	1929	18	—
1922	434	—	1930	37	1
1923	839	4	1931	61	—
1924	276	14	1932	49	14
1925	203	6	1933	70	12
			1934	20	2
TOTAL—Tembura ... 3,885			Yambio ... 58		

The focus of infection reported last year in Yambio district appears to have been effectively dealt with.

The infected area near Tembura still provides sporadic cases. All inhabitants have been moved from this area, but it is impossible to avoid a certain amount of trespass until the people become accustomed to their new environment.

### MONGALLA.

The following list shows the number of cases reported since 1918 :—

Year	Yei	Kajo-Kaji	Nimule	Year	Yei	Kajo-Kaji	Nimule
1918	32	42	2	1926	—	3	—
1919	15	63	8	1927	1	—	18
1920	32	54	2	1928	1	—	—
1921	24	31	12	1929	—	—	—
1922	7	68	35	1930	—	—	—
1923	3	5	4	1931	—	—	—
1924	—	82	9	1932	—	—	—
1925	—	10	9	1933	1	—	—
				1934	4*	6†	—

TOTAL—Yei ... 120      Kajo-Kaji ... 364      Nimule ... 99

\* 3 contracted in Belgian Congo.      † 4 infected in Uganda.

Of 10 cases reported in 1934, 7 were infected outside the Sudan. It seems inevitable that small outbreaks will occur in this province in the near future as the disease is epidemic across the frontier, and it has been found impossible, even with the most stringent administrative measures, to prevent a certain amount of illicit traffic across the border. Every effort is being taken by clearing river banks and regular inspections of the total population to ensure that an outbreak will be reported at once and effectively dealt with.

## GENERAL.

A large staff is at present employed in the prevention of Sleeping Sickness. Some idea of the extent of the work may be gathered from the fact that 563,798 medical examinations were carried out in 1934. It is hoped in time to decentralise much of this work to dispensaries, but it will be some years before the dispensary staffs are sufficiently trained to undertake it.

Meanwhile it is impossible to relax our efforts owing to the imminent danger of infection from neighbouring countries.

## TUBERCULOSIS.

994 Cases were admitted to hospital of whom 557 were pulmonary and 437 non-pulmonary.

The highest incidence is in the Dongola Province from which domestic servants proceed to Egypt and live under conditions favourable for the propagation of this disease. Consequently many return home suffering from pulmonary tuberculosis. A somewhat similar state of affairs exists at Kassala another frontier province where the starving Abyssinians who wander over the border in search of work are highly susceptible to tuberculosis, and a constant menace to public health.

It is hoped that the efforts that are being made to improve the housing conditions and dietetic habits of the people may assist in combating this disease.

54 of the pulmonary cases were foreigners and 10 were Sudanese who were known to have contracted the disease in Egypt.

The nationality of foreigners affected by pulmonary and non-pulmonary tuberculosis was as follows :—

						<u>Pulmonary.</u>	<u>Non-pulmonary.</u>
West Africans	...	...	...	...	...	15	18
Abyssinians	...	...	...	...	...	19	9
Eritreans	...	...	...	...	...	7	6
Yemenese	...	...	...	...	...	6	2
Somali	...	...	...	...	...	1	2
Egyptians	...	...	...	...	...	1	1
British	...	...	...	...	...	5	—
						<hr/>	<hr/>
						54	38
						<hr/>	<hr/>

The following table shows the admissions and percentage rate of tuberculosis to other admissions for the northern and southern Sudan :—

	1931		1932		1933		1934	
	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.	Pulmonary.	Nou-Pulmonary.	Pulmonary.	Non-Pulmonary.
<b>NORTHERN SUDAN.</b>								
Admissions for TB	320	256	380	228	419	352	452	343
Total admissions	40,286		42,007		49,104		57,003	
%TB to total Adms.	0.79	0.63	0.90	0.54	0.85	0.72	0.79	0.60
	1.42		1.44		1.57		1.39	
<b>SOUTHERN SUDAN.</b>								
Admissions for TB	70	38	41	53	102	42	105	94
Total Admissions...	19,450		17,635		21,211		28,987	
%TB to total Adms.	0.36	0.19	0.23	0.30	0.48	0.20	0.36	0.32
	0.55		0.53		0.68		0.68	

The following table shows the admissions for pulmonary and non-pulmonary tuberculosis since 1922 and the percentage rate of tuberculosis cases to other admissions :—

YEAR.	Pulmonary.		Non-Pulmonary.		Total.	
	Admissions.	Percentage.	Admissions.	Percentage.	Admissions.	Percentage.
1922 ...	140	0.82	94	0.56	234	1.38
1923 ...	123	0.72	128	0.74	251	1.46
1924 ...	159	0.80	131	0.66	290	1.46
1925 ...	135	0.62	157	0.84	292	1.46
1926 ...	175	0.80	196	0.91	371	1.71
1927 ...	226	0.86	178	0.69	404	1.55
1928 ...	260	0.82	327	0.75	497	1.57
1929 ...	302	0.65	322	0.70	624	1.35
1930 ...	480	0.95	300	0.61	780	1.56
1931 ...	390	0.65	294	0.49	684	1.14
1932 ...	421	0.70	281	0.47	702	1.17
1933 ...	521	0.74	394	0.56	915	1.30
1934 ...	557	0.65	437	0.50	994	1.15



Comparative table shewing the occupation of persons affected with pulmonary tuberculosis in the northern Sudan during the last three years :—

OCCUPATION.	Cultivators	Nomads	Soldiers & Police	Day Labourers	Townsmen	Women not employed	Unknown or of no occupation	Children	Total
1932 ... ..	87	8	12	66	94	41	72	—	380
1933 ... ..	116	22	17	46	105	60	53	—	419
1934 ... ..	124	25	5	57	110	79	47	5	452

Comparative table shewing the percentage rates of pulmonary tuberculosis to other admissions in provinces over the last three years :—

Province.	Bahr-el-Ghazal	Berber	Blue Nile	Darfur	Dongola	Fung	Halfa	Kassala	Khartoum	Kordofan	Mongalla	Port Sudan	Upper Nile	White Nile
1932 ....	.23	.83	.93	.39	1.5	1.15	2. 7	.46	1.14	.65	.05	1.96	.45	. 5
1933 ....	.72	.95	.97	.24	1.2	.70	2.04	1.1	1.3	.34	.15	2.2	.52	.52
1934 ...	.52	1.06	.94	.34	1.9	.80	0.82	1.45	1.28	.21	.15	1.3	.36	.64

### Age Incidence.

The following table compares the age group incidence of cases and deaths of pulmonary tuberculosis over the last three years :—

		Under 1		1-10		10-20		20-30		30-40		40-50		50-60		Over 60		Undefin ed.	
		C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D
Northern Sudan	1932	1	1	4	—	46	11	159	38	88	22	47	18	20	4	15	7	4	—
	1933	—	—	5	1	37	6	160	33	119	32	53	12	35	10	8	4	2	1
	1934	—	—	5	2	25	—	147	24	111	22	44	8	30	7	12	3	81	4
Southern Sudan	1932	—	—	—	—	4	1	12	2	11	1	5	1	—	—	1	—	8	1
	1933	—	—	1	—	17	1	24	1	22	2	9	1	2	1	1	—	26	8
	1934	—	—	8	—	8	—	33	6	35	4	9	1	4	—	—	—	5	—

### Incidence Among School Children.

No cases were found during the routine examination of 22,751 school-children.

### Subsequent disposal after notification.

Arrangements have been made for cases admitted to the Omdurman Civil Hospital, and to the Church Missionary Society Hospital to be followed up subsequently. The table show the cases dealt with during the last seven years :—

YEAR.					Cases notified.	Lost trace of.	Died.	Remaining.
1928	...	...	...	...	22	14	8	—
1929	...	...	...	...	16	10	6	—
1930	...	...	...	...	33	9	22	2
1931	...	...	...	...	12	4	7	1
1932	...	...	...	...	24	5	13	6
1933	...	...	...	...	28	12	12	4
1934	...	...	...	...	17	4	3	10

TUMOURS.

626 cases were admitted to hospital, classified as follows :—

	Carcinoma	74						
Malignant	Sarcoma	39	...	...	...	...	...	166
	Unclassified	53						
Benign	...	...	...	...	...	...	...	460

The following are the comparative figures for the northern and southern Sudan, shown as percentage of total admissions for the past four years :—

	1931		1932		1933		1934	
	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.
NORTHERN SUDAN. Admissions for new growths ... ..	131	313	141	295	163	363	145	338
Total Admissions...	40,286		42,007		49,104		57,003	
%to total admissions	0.32	0.77	0.33	0.70	0.33	0.74	0.25	0.59
SOUTHERN SUDAN. Admissions for new growths ... ..	15	98	16	165	20	113	21	122
Total Admissions ...	19,450		17,635		21,211		28,987	
%to total admissions	0.07	0.50	0.09	0.93	0.09	0.53	0.07	0.42

The race incidence for malignant growths was as follows :—

Arab	...	...	...	...	...	...	...	128	—	77.1%
Negroid	...	...	...	...	...	...	...	31	—	18.7%
Others	...	...	...	...	...	...	...	7	—	4.2%

TYPHOID FEVER.

A total of 188 cases of typhoid and paratyphoid fevers were reported. Of these 7 were classified as para-typhoid A, and 8 as paratyphoid B.

Cases reported since 1927 are as follows :—

	Cases.
1927 ... ..	52
1928 ... ..	132
1929 ... ..	86
1930 ... ..	73
1931 ... ..	100
1932 ... ..	85
1933 ... ..	204
1934 ... ..	188

In Omdurman 74 cases were notified during the year, but no definite source of infection could be traced. The disease mainly affected the young, the majority of cases being under 20 years of age.

An increased number of sporadic cases is reported from Halfa and Dongola.

17 cases and 1 death occurred in Malakal.

The distribution by Provinces was as follows :—

Bahr el Ghazal	...	...	...	...	...	...	...	1
Berber	...	...	...	...	...	...	...	8
Blue Nile	...	...	...	...	...	...	...	14
Darfur	...	...	...	...	...	...	...	3
Dongola	...	...	...	...	...	...	...	11
Halfa	...	...	...	...	...	...	...	18
Kassala	...	...	...	...	...	...	...	8
Khartoum	...	...	...	...	...	...	...	101
Kordofan	...	...	...	...	...	...	...	1
Mongalla	...	...	...	...	...	...	...	1
Port Sudan	...	...	...	...	...	...	...	5
Upper Nile	...	...	...	...	...	...	...	17
TOTAL ...								188

## UNDULANT FEVER.

51 cases with 8 deaths were reported in 1934 as against 25 in 1933 and 26 in 1932.

The distribution for the past four years is as follows :—

						1931	1932	1933	1934
Berber	...	...	...	...	...	—	—	—	1
Blue Nile	...	...	...	...	...	10	10	6	17
Darfur	...	...	...	...	...	—	—	7	7
Fung	...	...	...	...	...	—	1	—	—
Kassala	...	...	...	...	...	11	8	10	21
Khartoum	...	...	...	...	...	2	2	1	—
Port Sudan	...	...	...	...	...	1	3	1	—
Mongalla	...	...	...	...	...	—	—	—	2
Upper Nile	...	...	...	...	...	—	1	—	1
White Nile	...	...	...	...	...	1	1	—	2
TOTAL						25	26	25	51

In the Blue Nile Province a focus of infection was detected near Sennar, where a goat was found positive for *B. melitensis*. 14 cases with no deaths occurred.

In the Kassala Province 21 cases with 6 deaths were reported from 14 villages.



# SYPHILIS AND YAWS.

The incidence of yaws continues to decrease and it is now a rare disease, except in a few remote districts of the southern provinces. The use of Bisoxyl and Sobita instead of Novarsenobenzol has enabled work to be undertaken on an extensive scale against this disease. The local medical authorities find the Bismuth preparations satisfactory.

As regards Syphilis, the consensus of medical opinion is that the incidence is decreasing. Work carried out in the White Nile Province gives some indication of the present situation regarding this disease :—

Kahn Tests.			
Number Examined	Positive.	Negative.	% Positive
<hr/> 153	<hr/> 20	<hr/> 133	<hr/> 13.0

The numbers examined are too few for accurate deductions to be made, and the general incidence is probably lower than these figures indicate.

Again the result of investigations carried out among pregnant women in Omdurman Civil Hospital, showed that syphilis was not a frequent cause of abortion.

				Kahn Tests.			
				Cases.	Positive.	Negative.	% Positive
Control cases	...	...	...	88	5	83	6.0
Abortions	...	...	...	43	2	41	4.6

Treatment has developed considerably, and every effort is made to ensure that it is complete.

Novarsenobenzol is only given if treatment is likely to be complete. Bisoxyl and Sobita only are given at dispensaries, with few exceptions.

In most hospitals a combined course of Novarsenobenzol and Bisoxyl is given. The Sudanese prefer Novarsenobenzol, partly owing to its stimulating effects and partly because they dislike intramuscular injections.

It is of interest to record that approximately 1,045,600 doses of Bisoxyl, 77,760 doses of Sobita, and 30,500 doses of Novarsenobenzol were issued in 1934.

**Darfur.** The Senior Medical Inspector organised a campaign against Syphilis two years ago, and as a result the incidence shows a decrease.

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## PUBLIC HEALTH

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### GENERAL REMARKS.

**Meteorology.** The rains were early, and well spaced, the rainfall about normal.

The Nile flood was of short duration and exceptionally high.

Extensive areas in the northern Sudan were flooded, and it was feared an early increase in the incidence of malaria would result.

Fortunately the river fell rapidly, and inundated areas quickly dried up. These two factors together with the additional antimalarial precautions taken were instrumental in preventing any marked increase in the disease.

The forecast that a cold winter would follow the exceptionally high flood proved correct.

It is probable that the cold north wind is the most potent factor in the inhibition of mosquito breeding in the northern and central Sudan.

**General health.** Improved economic conditions and good crops are reflected in a noticeable decrease in the incidence of disease in certain provinces.

Hospital statistics throughout the country tend to show that the general health of the native is on the up-grade, and that his resistance to endemic disease shows a slight but steady improvement.

Famine and epidemics will, however, continue to take their toll of life so long as the native remains improvident, and persists in living under conditions as primitive as those of his ancestors.

Future preventative medicine in the Sudan lies in a concerted effort to improve the diet, housing, and living conditions of the people in their villages.

**General sanitation.** Steady progress in the extension and improvement of the sanitation of towns has been maintained.

Clearing of insanitary areas and some amelioration of the problem of overcrowding has been achieved.

The policy of replacing bucket by pit latrines, where conditions are favourable, has been continued.

In places where a piped water supply is available the possibility of installing the water carriage system combined with small, self-contained "septic tank" installation is being inquired into.

This system has proved very successful in the colonies at Gebel Sileitat and Gebel Aulia.



Consideration has been given to the difficult problem of village sanitation. Efforts are being made to improve the general cleanliness of villages, and to control the type and lay-out of new huts and dwellings.

**Housing.** In the light of recent research, certain improvements have been introduced in the design and construction of European dwellings. Many of the roofs of houses and public buildings in Khartoum have been lime-washed or painted white with an appreciable lowering of temperature.

Double roofing with aluminium foil insulation is being tried out in the newly-constructed wards of Khartoum and Omdurman hospitals.

At the new teachers' Training School at Dueim, an attempt has been made to demonstrate the application of elementary hygienic principles to village conditions.

In the construction of houses, latrines, wells and markets, care has been exercised to utilise as far as possible material which is normally available to the native, so that the lessons learnt can be put into practice in every rural area.

It is hoped to establish a model village on similar lines at the new Deims Khartoum. Various types of "Ideal homes" with details of cost, will be available for inspection by visiting officials, sheikhs and omdas.

Such a scheme provides a useful form of propaganda and should lead to the appearance of model houses in all parts of the country. Thus, by the force of example and healthy rivalry, it is hoped that gradually the standard of housing will be raised.

The epidemic of cerebrospinal meningitis in Kordofan once more emphasised the importance of over crowding as the main factor in the spread of the disease. Ventilation of huts and sleeping in the open proved the most useful measures of control. As a precaution against a further outbreak of the disease at Gebel Aulia, all labourers are being housed in large, temporary, well-ventilated shelters.

**Water Supplies.** Purification plants and piped water supplies are installed at Khartoum, Omdurman, Wad Medani, Abu Usher and Juba. The Egyptian Irrigation colonies at Malakal, Gebel Aulia and Gordon's Tree Dockyard are similarly provided for.

The bulk of the population draw their supply direct from the Nile and its tributaries, or from wells.

In the Gezira irrigated area, villagers draw their water from neighbouring canals. This practice gives rise to some anxiety, as during the "close down" period the water in the minor canals is stagnant and often contaminated with animal and possibly human excreta. The danger is being counteracted by encouraging villagers to re-open the well supplies and by reducing the number of canals maintained to a minimum.

During the year experiments were carried out to determine the value and dosage of chloroscene and ammonia in the purification of water supplies. Satisfactory results were obtained at Gebel Aulia, and the method is now being used on a large scale.

**Diet.** Preliminary investigations have been begun to enquire into the natural diet of the people, its deficiencies, its economic and nutritional value.



During the past year, certain modifications have been introduced into the diet of prisoners. These, without reducing the nutritional value of the diet, have allowed an increased consumption of locally-grown products, and a corresponding economy in the importation of foreign foodstuffs.

With a better knowledge of the dietetic value of home-grown crops, more can be done in this direction.

In southern Kordofan, propaganda relating to the role of diet in the etiology of disease has been circulated to all officials, garrisons and missionaries.

The medical inspector drew attention to the existent evils of a six months' dessication resulting in a lack of the food sources of the principal vitamins.

The need for perennial cultivation and an increase in the supply of meat, milk, fruit and vegetables was emphasised.

Practical effect has been given to these recommendations in the establishment of vegetable and fruit gardens in all hospitals and dispensaries in this area.

Their object is to improve the diet of staff and patients, to cultivate a liking for fruits and vegetables amongst the natives, and to serve as a means of agricultural training for future assistant medical officers.

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## HEALTH ORGANISATION

**Medical Officers of Health.** Public Health work in Khartoum Province, which includes the towns of Khartoum, Khartoum North and Omdurman, is under the control of the Medical Officer of Health of Khartoum and his Assistant.

The population of the three towns is estimated at 178,766, that of the rest of the province at 81,523.

In the other provinces the Medical Officer of Health is the Senior Medical Inspector of the province. In these provinces it is necessary in order to ensure economy of effort and the maximum efficiency in the use of personnel, that the administration, both of preventive and curative medical work should be combined under a single head. This is not only the case in the less developed provinces, but is felt to be even more important in a thickly populated area such as the Gezira Irrigated Area.

**British Sanitary Inspectors.** There are 15 British Sanitary Inspectors. Their distribution is as follows :—

Khartoum	...	...	...	...	...	...	...	...	4
Omdurman	...	...	...	...	...	...	...	...	2
Blue Nile Province	...	...	...	...	...	...	...	...	5
Port Sudan	...	...	...	...	...	...	...	...	1
Berber Province	...	...	...	...	...	...	...	...	2
Gebel Aulia	...	...	...	...	...	...	...	...	1

The Chief Sanitary Inspector is responsible for the training of subordinate staff and is also demonstrator in sanitation to the Kitchener School of Medicine.

**Quarantine Medical Officer.** Quarantine work at Port Sudan is in charge of a Medical Officer working under the supervision of the Senior Medical Inspector.

A Medical Inspector and a Medical Officer are posted at Suakin during the pilgrim season, an Assistant Medical Officer is in permanent residence.

Wadi Halfa quarantine is under the supervision of the Senior Medical Inspector assisted by a Medical Officer.

**Sudanese Sanitary Officers.** This is a new type of Sudanese official who undergoes a three years' course of training, after selection from the scientific class of the Gordon College. The first year is spent at the Kitchener School of Medicine, the remaining two under the public health authority.

The first two qualified in December. It is anticipated that they will fill the less responsible posts at present held by Sanitary Inspectors.

Two more students commenced their training at the beginning of the year, and a further three have been selected for 1935.

**Sanitary Overseers.** These are natives with some elementary education, who are trained by British Sanitary Inspectors and who work under their supervision. In the towns, under the British Sanitary Inspectors, they supervise conservancy work, inspect for nuisances and do antimalarial work in and around towns. In the irrigated areas they inspect for and report mosquito breeding and leakages from the canals, and are in charge of oiling parties. In certain larger towns where there are no British Sanitary Inspectors, they carry out the duties of a Sanitary Inspector under the general supervision of the Medical Inspector.

Sanitary Overseers are distributed throughout the country.

Periodically they are brought into Khartoum for revision and further training.

**Assistant Medical Officers.** In outlying districts where no sanitary personnel is available, the Assistant Medical Officer in charge of the dispensary is also responsible for the sanitation of the area.

**Subordinate Staff.** This consists of house to house inspectors, mosquito men, conservancy personnel, etc.

Candidates for training as Sanitary Overseers are frequently drawn from these junior posts, usually the most successful are those who have worked their way up through the ranks of the sanitary service.

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# THE HEALTH AND SANITATION OF TOWNS.

## (a) KHARTOUM PROVINCE.

### GENERAL.

During 1934 the public health of the province has maintained a satisfactory standard. Some lightening of the economic depression and the prevailing low prices of foodstuffs have no doubt reacted beneficially on the health of the natives.

An outbreak of cerebrospinal meningitis commenced in March. The cases were almost entirely confined to the Gebel Aulia district.

In the first half of the year there were considerable epidemics of measles, whooping cough and chickenpox throughout the province.

With the exception of enteric fever there has been a marked fall in the notifications of all endemic diseases. In spite of the heavy rains and unusually high Nile the incidence of malaria was considerably less than in the previous year.

Many of the projects referred to in the last Annual Report for clearing the most insanitary areas in the city have been brought about and considerable improvement has been achieved.

Some amelioration of the problem of overcrowding has been attained, but much remains to be done. It is hoped that the development of the new Deims may attract the poorer class of native out of the city. Until, however, the sanitary amenities of Khartoum are available in the Deims, it is unlikely that the native, having experienced the former, will be willing to live under the more backward conditions of the latter.

### POPULATION.

The population of the province was estimated as 260,289.

The following table shows the estimated population of each locality :—

	Men.	Women.	Children.	Total.
Khartoum ... ..	13,830	14,948	17,898	46,676
Khartoum North ... ..	6,280	6,824	8,027	21,131
Omdurman ... ..	27,485	36,438	47,036	110,959
Gebel Aulia ... ..	6,447	959	714	8,120
Rest of Rural District ... ..	22,270	21,556	29,577	73,403
<b>TOTAL</b> ... ..	<b>76,312</b>	<b>80,725</b>	<b>103,252</b>	<b>260,289</b>



Of the above the following are non-natives of the Sudan :—

	Men.	Women.	Children.	Total.
Khartoum ... ..	2,797	1,753	2,093	6,643
Khartoum North ... ..	286	205	343	834
Omdurman ... ..	685	457	669	1,811
Gebel Aulia ... ..	2,287	238	98	2,623
Rest of Rural District ... ..	596	68	211	875
TOTAL ... ..	6,651	2,721	3,414	12,786

## BIRTHS AND DEATHS.

4,055 births and 2,492 deaths were registered during the year, an excess of births over deaths of 1,563.

Births showed a decrease of 1,132 and deaths a decrease of 379 as compared with the figures of 1933.

The figures for the three towns correspond closely with the figures of previous years. The drop has occurred in the figures returned from the Rural District.

It is yet too early to comment on this fall in the returns from the Rural District. During the course of the year a change was made in the method of collecting these figures, and the new arrangement must be regarded as yet in its experimental stages.

## Death Rate in Three Towns :—

Khartoum ... ..	11.69
Khartoum North ... ..	11.31
Omdurman ... ..	11.44

The above figures are per 1,000 of the estimated population.

## Deaths by Age Periods and Sexes :—

Khartoum, Khartoum North, Omdurman and Rural District.

								Total.	
		0-1	1-5	5-10	10-20	20-40	40-60	Over 60	
		—	—	—	—	—	—	—	M. F.
Deaths	...	303	510	107	128	385	255	804	1211 1281
									2492

## COMMUNICABLE DISEASES.

Apart from enteric fever and cerebrospinal meningitis there was a considerable decrease in the notifications of the more important communicable diseases.

Only 57 cases of locally contracted primary malaria were notified from the three towns, compared with 191 in 1933 and 115 in 1932.

Considerable outbreaks of measles, whooping cough and chicken pox prevailed during the early months of the year. It is not possible to assess the incidence of these diseases from the notifications received. They are generally lightly regarded by the natives and in the first two diseases treatment is rarely sought until the supervention of more or less grave complications. With regard to chicken pox the number of pupils found with recent scars of the disease at the school medical inspection gave some measure of its incidence.

The more important communicable diseases are dealt with at length under their respective headings.

# COMMUNICABLE DISEASES

TABLE I.

SHOWING NUMBER OF CASES NOTIFIED AND PLACE.

Disease	Khartoum Local Cases	Khartoum North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural Dist. Cases	Imported Cases	Relapsed Cases	Grand Total
Chicken Pox... ..	70	11	42	123	16	10	—	149
Diphtheria ... ..	5	—	3	8	1	1	—	10
Cerebrospinal Meningitis... ..	1	1	3	5	83	1	—	89
Ancylostomiasis ... ..	—	—	—	—	8	10	—	18
Bilharziasis ... ..	—	2	12	14	10	38	—	62
Amoebic Dysentery	10	2	30	42	18	15	141	216
Bacillary Dysentery	16	1	8	25	1	4	3	33
Enteric Fever ... ..	20	2	74	96	—	5	—	101
Leprosy ... ..	—	3	11	14	1	12	—	27
Malaria ... ..	39	7	11	57	1465	386	382	2290
Blackwater Fever ... ..	1	—	—	1	—	—	—	1
Measles ... ..	88	118	28	234	33	6	—	273
Mumps ... ..	2	3	—	5	1	—	—	6
Whooping Cough ... ..	17	2	15	34	—	3	—	37
Tuberculosis, Pulmonary ... ..	20	6	11	37	14	32	—	83
Tuberculosis, Non- Pulmonary ... ..	13	5	14	32	10	17	—	59

## MALARIA.

227.4 mms. of rain fell during the year. Heavy rains commenced unusually early and the total fall was fairly evenly divided between the four months June to September. This even division of the rainfall considerably facilitated the work of dealing with the resulting rain pools.

The Nile reached an abnormally high level. The rise and fall, however, were steady and no unusual difficulty was experienced in dealing with pools on the foreshore.

Only 2,290 cases of malaria were recorded during the year, a decrease of 2,924 as compared with 1933. Of these cases 57 were apparently primary infections in the three towns, 1,465 were from the Rural District, 382 were relapsed cases and 386 were imported. As in 1933 no effort has been made to differentiate between primary and relapsed cases in Rural District and imported cases.

The malarial incidence compared very favourably with that of recent years. Whether this may be attributed to an extension of our antimalarial measures or whether to one of the cycles of varying incidence of this disease with which one has been familiar in the past, it is as yet too early to judge.

The general mosquito incidence in the province was much lower than in previous years. The Khartoum infections are down by 530 while Khartoum



North and the Rural District show decreases of 534 and 649 respectively. The Omdurman infections show an increase of 848 but this is mainly due to the 1933 figure being much lower than usual.

The decrease of 649 in the Rural District is phenomenal considering the prevailing conditions. Rainfall was heavier than last year but the main feature was the height of the Nile which caused excessive flooding in cultivations and along the banks and gave rise to conditions which, had this been an “ Anopheline year,” would have proved disastrous. In this connection it is interesting to recall the conditions which prevailed during the latter part of 1932. There is no doubt that ground conditions were much less favourable to breeding then than they were during the similar period of 1934, yet in 1932 we had tremendous Anopheline infections. It certainly lends support to the theory then expressed that there is a definite cycle of “ Anopheline years ” due to conditions not yet known but certainly not entirely dependant upon the prevalence of favourable breeding sites.

The following table showing the number of infections found and the rainfall during the past 5 years is of interest :—

	1930	1931	1932	1933	1934
Rainfall...      ...      ...      m/ms.	223.1	205.1	191.5	125.6	227.4
Khartoum Infections found ...	2,595	3,500	3,180	1,925	1,395
Omdurman      „      „      ...	1,248	2,252	1,690	1,188	2,056
Khartoum N.      „      „      ...	554	1,205	2,086	1,059	525
Rural District      „      „      ...	5,478	5,442	7,360	3,421	2,772
TOTAL      ...      ...	9,875	12,399	14,316	7,593	6,748

The following table shows the incidence of primary malaria by nationality. Also cases amongst British Troops and types of parasite.

#### Nationalities.

British      ...      ...      ...      ...      ...      ...      ...      ...      ...      27
Sudanese...      ...      ...      ...      ...      ...      ...      ...      ...      24
Others      ...      ...      ...      ...      ...      ...      ...      ...      ...      6

#### Types of Parasites.

Malignant Tertian      ...      ...      ...      ...      ...      ...      ...      ...      37
Benign Tertian      ...      ...      ...      ...      ...      ...      ...      ...      18
M.T. and B.T.      ...      ...      ...      ...      ...      ...      ...      ...      2

#### All Cases Amongst British Troops.

			M.T.	B.T.	M.T. & B.T.	Undefined.	Total
			<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Khartoum	...	...	9	5	1	—	15
Khartoum North	...	...	4	2	—	—	6
Imported	...	...	8	—	1	1	10
Relapsed	...	...	3	11	—	3	17
			<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
TOTAL		...	24	18	2	4	48



One case of blackwater fever was notified during the year. The patient was a policeman, said never to have been out of Khartoum. He had had several previous attacks of malignant tertian malaria for which he had not received adequate treatment.

### **CHICKEN POX.**

149 cases were notified as compared with 56 in 1933. As mentioned above notification is no more than an indication of the prevalence of the milder zymotic diseases. Only a small proportion of the cases ever present themselves for medical aid, unless a coincident outbreak of small pox has frightened the population into seeking advice and treatment for “false small pox.”

There is, however, no doubt that a considerable epidemic of chicken pox was prevalent in the early months of the year.

### **DIPHTHERIA.**

Only 10 cases of this disease were notified. Of these one was contracted in the Rural District and one was imported. Routine swabbing of contacts discovered 3 carriers.

### **CEREBROSPINAL MENINGITIS.**

89 cases of cerebrospinal meningitis were notified. Of these 67 were fatal, a mortality rate of 75.3%.

The first case—a boy from Khartoum North—was taken ill about 3.3.34 and the second case—a man from Khartoum Deims—about ten days later.

A case occurred in Gebel Aulia on 16.3.34. There was no probability of contact with the first two cases. Thereafter 80 further cases occurred in the Gebel Aulia District. 2 in March, 14 in April, 53 in May and 11 in June.

Vigorous prophylactic and quarantine measures were instituted and the outbreak was kept in check until the early and heavy rainfall in June ended the epidemic.

At the end of March two cases were discovered at Sururab West, a village some twenty miles North of Omdurman. No further extension of the disease occurred here.

In May and June three isolated cases occurred in Omdurman and one imported case from Medani was discovered but, practically, the epidemic in this province was confined to the Gebel Aulia District.

### **MEASLES.**

273 cases of measles were notified during the year. A widespread epidemic of this disease prevailed during the first half of the year and there is little doubt that this figure represents only a very small percentage of the total incidence.

In this province measles is usually a disease of very minor virulence. The natives recognize it and rarely seek medical advice. During 1934, however, the virulence of the disease and the serious complications apt to follow in its wake, appeared greatly increased. A number of deaths were reported and many cases of serious illness or debility following measles were later seen at the hospital.



### Cases by Nationality.

British ...	...	...	...	...	...	...	...	...	2
Sudanese ...	...	...	...	...	...	...	...	...	93
Others ...	...	...	...	...	...	...	...	...	6

In this report the term enteric fever includes typhoid and para-typhoid. The following table shows the type of organism :—

B. typhosus ...	...	...	...	...	...	...	...	...	95
B. para typhosus A ...	...	...	...	...	...	...	...	...	1
Undefined ...	...	...	...	...	...	...	...	...	5

### Mortality.

Cases ...	...	...	...	...	...	...	...	...	101
Deaths ...	...	...	...	...	...	...	...	...	8
Mortality rate	...	...	...	...	...	...	...	...	7.92%

### LEPROSY.

27 cases were reported compared with 14 in 1933. Of these cases 12 were imported. The number of cases presumably contracted within the province showed an increase of 9 over the figures for the previous year.

One case was imported from French Equatorial Africa, the remainder being Sudanese.

The following table shows the probable place of infection of imported cases :—

Kordofan Province ...	...	...	...	...	...	...	...	...	3
Berber „	...	...	...	...	...	...	...	...	2
Blue Nile „	...	...	...	...	...	...	...	...	2
Darfur „	...	...	...	...	...	...	...	...	2
Dongola „	...	...	...	...	...	...	...	...	1
Fung „	...	...	...	...	...	...	...	...	1
French Equatorial Africa ...	...	...	...	...	...	...	...	...	1

The following table shows the disposal of 67 cases notified from 1927-1933 :—

YEAR.			No. of Cases.	Died.	Returned home.	Under treatment.	Untraced.
1927	...	...	6	1	2	2	1
1928	...	...	9	3	2	3	1
1929	...	...	5	1	2	2	—
1930	...	...	8	—	4	4	—
1931	...	...	6	2	—	4	—
1932	...	...	19	3	9	6	1
1933	...	...	14	—	11	3	—
TOTAL			67	10	30	24	3



## TUBERCULOSIS.

83 cases of pulmonary tuberculosis and 59 cases of non-pulmonary tuberculosis were notified during the year. Cases of pulmonary tuberculosis contracted within the province showed a decrease of 7 and non-pulmonary tuberculosis a decrease of 14 as compared with 1933.

Imported cases of pulmonary and non-pulmonary tuberculosis showed a decrease of 13 and 1 respectively.

The resistance of the native to tuberculosis is low and the prognosis in an established case is grave.

The only successful method of combating tuberculosis is prevention, the putting of the individual in the best position to avoid and to resist tuberculous infection. A campaign against tuberculosis becomes an economic as well as a medical problem. It involves a raising of the standard of living and an improvement of the housing conditions, especially amongst the poorer classes.

The case incidence in the three towns was:—

					Pulmonary.	Non-pulmonary.
					<hr/>	<hr/>
Khartoum	...	...	...	...	.428	.279
Khartoum North	...	...	...	...	.331	.237
Omdurman	...	...	...	...	.090	.126

These figures are per 1000 of the estimated population.

### Cases by Sexes.

(1) LOCAL CASES.					Pulmonary.	Non-pulmonary.
					<hr/>	<hr/>
Male	...	...	...	...	37	30
Female	...	...	...	...	14	12
(2) IMPORTED CASES.						
Male	...	...	...	...	31	17
Female	...	...	...	...	1	0

### Local Cases. Probable Place of Infection.

				Pulmonary.	Non-pulmonary.	Total.
				<hr/>	<hr/>	<hr/>
Khartoum	...	...	...	20	13	33
Khartoum North	...	...	...	7	5	12
Omdurman	...	...	...	10	14	24
Rural District	...	...	...	14	10	24
TOTAL	...	...	...	<hr/> 51	<hr/> 42	<hr/> 93

**Imported Cases. Probable Place of Infection.**

PLACE.				Pulmonary.	Non-Pulmonary.	Total.
Berber Province	...	...		8	2	10
Blue Nile Province	...	...		7	3	10
Dongola Province	...	...		4	3	7
White Nile Province	...	...		2	4	6
Port Sudan	...	...	...	3	—	3
Upper Nile Province	...	...		2	1	3
Fung Province	...	...	...	2	—	2
Darfur Province	...	...		—	1	1
Kordofan Province	...	...		—	1	1
Kassala Province	...	...		—	1	1
Bahr el Ghazal Province	...	...		—	1	1
England	...	...	...	2	—	2
Abyssinia	...	...	...	2	—	2
TOTAL				32	17	49

**Cases by Nationality.**

				Pulmonary.	Non-pulmonary.	Total.
British	...	...	...	2	—	2
Sudanese	...	...	...	72	57	129
Abyssinians	...	...	...	5	—	5
Fellata	...	...	...	2	1	3
Egyptians	...	...	...	1	—	1
Yemenese	...	...	...	—	1	1
Bergawi	...	...	...	1	—	1
TOTAL				83	59	142

**Cases by Age Periods.**

	0-5	5-10	10-20	20-30	30-40	40-50	50-60	Over 60
Pulmonary	—	1	6	31	25	9	6	5
Non-pulmonary	5	4	9	17	12	7	3	2

The following table shows the disposal of cases notified during the year :—

						Pulmonary.	Non-Pulmonary.
Died	...	...	...	...	...	36	11
Left Province	...	...	...	...	...	21	8
Still in hospital	...	...	...	...	...	17	8
Still in Province	...	...	...	...	...	7	29
Untraced	...	...	...	...	...	2	3
TOTAL						83	59

Of 83 cases of pulmonary tuberculosis notified during the year, 36 have died, a mortality rate of 43.4%. But a further 21 cases have left the province and 2 are untraced.

Frequently those cases departing from the province return to homes remote from a medical centre and no further information concerning them is available.

Of 51 cases contracted within the province, 4 have left the province and 2 were untraced. Of the 45 remaining 29 have died.

In fatal cases the average time elapsing between notification and death was about 9 weeks.

The following table shows the result of a follow up of 550 cases of pulmonary tuberculosis notified between 1927 and 1933.

281 cases have died, 165 cases have left the province and 67 have not been traced.

Year of Notification.			No. of Cases.	Died	Condition in December, 1934.		
					Left District.	Alive in District.	Untraced.
1927	...	...	65	30	17	3	15
1928	...	...	66	33	14	1	18
1929	...	...	74	29	31	2	12
1930	...	...	82	45	29	3	5
1931	...	...	67	36	22	2	7
1932	...	...	95	55	25	10	5
1933	...	...	101	53	27	16	5

## SMALL POX AND VACCINATION.

No case of smallpox was recorded during the year. A total of 3,850 vaccinations were performed, 1,312 in Khartoum, 461 in Khartoum North, 1,134 in Omdurman and 943 in the Rural District. This figure does not include the vaccination of prisoners on admission to the Khartoum North Central Prison,



## DISPENSARIES.

### Khartoum North.

In-patients during the year numbered 1,040 as compared with 860 in 1933.

49,905 outpatients attended the dispensary, an increase of 1,843 over the figure for the previous year.

Two deaths, one from pneumonia and one from heart disease, occurred in the dispensary.

### Rural District Dispensaries.

Attendances during the year.

Geili ...	...	...	...	...	...	...	7,614	
Khileila ...	...	...	...	...	...	...	5,841	
Sururab West	...	...	...	...	...	...	7,891	
Gereif East ...	...	...	...	...	...	...	7,020	
Tuti Island ...	...	...	...	...	...	...	12,193	
Gordon's Tree	...	...	...	...	...	...	7,657	
Deim Abu Saad	...	...	...	...	...	...	7,008	(May to Dec.)
Ailafun (Blue Nile Province)	...	...	...	...	...	...	13,532	(Feb. to Dec.)
TOTAL							68,756	

During the year the Assistant Medical Officer of Khileila Dispensary examined the urine of 1,256 persons for bilharzia. No cases were discovered.

A dispensary at Gebel Sileitat in charge of an Italian doctor served as a centre of treatment for the employees working in the quarries.

In addition to their work in the dispensaries all the dispensary staffs undertook regular tours of inspections and treatment in the outlying villages.

## KHARTOUM CENTRAL PRISON.

The average daily strength of prisoners of all categories was 426.

The health of the prisoners has been eminently satisfactory. 123 in-patients received treatment in the prison dispensary compared with 266 in 1933.

31,742 attendances were made at out-patients, an increase of 435 over the previous year. The families of the prison warders have availed themselves to an increasing extent of the medical facilities afforded and such attendances are included in the foregoing figures.

### Diet.

Prisoners have received a good mixed diet with a calorie value of approximately 3,200. On this they have been able to do a hard day's work and the health and state of nutrition of prisoners generally showed marked improvement

during their detention. An improvement in the condition of juvenile prisoners has been especially noticeable.

Two deaths occurred in the prison hospital during the year, one from pneumonia and one from an undiagnosed fever.

### SCHOOL MEDICAL SERVICE.

Medical inspection was carried out in 19 schools. 2,361 pupils were examined, of whom 1,114 were referred for treatment.

The majority of cases referred were suffering from eye conditions, although a considerable improvement has resulted since the previous inspection.

The general health, physical condition and nutrition condition of the children was satisfactory.

The following tables are a summary of the results of school medical inspection in the past two years :—

	1933	Percentage	1934	Percentage
	—	—	—	—
No. of schools and colleges examined	17		19	
No. of pupils examined ... ..	2,140		2,361	
No. referred for treatment ... ..	1,573	73.5	1,114	47.2
Trachoma (active) ... ..	1,078	50.3	646	27.4
Conjunctivitis ... ..	54		16	
Defective Vision ... ..	448	20.9	380	16.1
Dental Caries ... ..	202	9.0	114	4.8
Albuminuria ... ..	98		103	
Glycosuria ... ..	4		2	
Cardiac defect ... ..	30		12	
Pulmonary diseases (Non-tubercular)	12		3	
Splenomegaly ... ..	29		30	
Enlarged liver ... ..	2		3	
Infected tonsils ... ..	26		13	
Ear disease ... ..	10		2	
Skin disease ... ..	7		7	
Physical defects ... ..	22		26	
Unvaccinated... ..	5		7	
Markedly bad physique ... ..	2		3	
Urinary bilharzia ... ..	2		12	
Gonorrhoea ... ..	—		2	
Anaemia ... ..	—		1	

**METEOROLOGICAL OBSERVATIONS**  
**AT**  
**STACK MEMORIAL RESEARCH LABORATORIES, KHARTOUM.**  
**1934.**

Month.	Temperature in Degrees Fahrenheit				Average Relative Humidity % at 8 a.m.	Average Evaporation in m.m.	Rains in m.m.	Haboobs and Sand storms	Prevailing Winds
	Highest Max.	Average Max.	Lowest Min.	Average Min.					
January ...	100.4	90.3	50.0	60.1	38	8.7	—	—	NNW.
February...	103.7	90.0	50.9	58.7	32	9.2	—	—	NNW.
March ...	109.2	101.7	56.8	66.8	21	12.1	—	—	NNW.
April ...	113.6	106.7	63.7	72.9	21	13.5	—	—	NNW.
May ...	112.7	106.0	66.2	78.3	34	12.3	13.4	9	{ 1st.-15th.NW. 16th.-31st.Veering
June ...	110.8	101.1	68.0	78.1	54	11.4	59.5	9	SW.
July ...	108.0	98.0	69.3	77.0	64	9.8	35.5	2	S to SW.
August ...	105.4	95.4	68.4	75.6	71	7.6	61.9	1	SW.
September	106.2	101.1	68.7	77.9	56	9.9	54.3	4	S to SW.
October ...	107.8	104.9	73.2	77.7	43	10.4	Drops	1	N to E. Veering
November	102.8	98.4	64.2	71.3	42	8.6	2.8	—	N to NNW.
December	96.8	88.9	49.6	60.8	40	7.8	—	—	N.
TOTAL =							227.4	26	Max. Wind Veloc. 76 Kilom. per hour.

**(b) WAD MEDANI.**

**GEZIRA.**

The main endemic disease in the Gezira is malaria. Bilharzia—although it occurs—is as yet uncommon. Sanitary measures, then, are directed to prevent or control mosquito breeding and to protect the water supply.

**Mosquito Precuations.** There was an undoubted improvement in 1934 ; factors contributing to this improvement were :—

- (a) Early and well spaced rains.
- (b) Earlier and better baling of field channels.
- (c) More active anti-mosquito measures before the rains, *e.g.* filling in of borrow pits, trenches and disused scour pits.
- (d) A change in the rotation of crops, so that less land was under cultivation and fewer potential breeding places for mosquitoes existed.
- (e) Oiling of scour pits.

Again this year about 80 % of infections found were anopheline, the remaining 20 % culex.

**Protection of the Water Supply.** Now that the Gezira is intersected by countless canals, the majority of the natives draw their water from this source. Unfortunately they also use the canals as latrines.



To prevent the spread of bilharzia and other waterborne disease, it is imperative to protect canal water from contamination with human excreta.

The problem is being dealt with on the following lines :—

1. The removal of all temporary villages and encampments to a distance of at least 300 metres from the nearest canal.

By the end of the year, of some 102 villages to be moved, 94 had been transferred to selected sites.

There is no doubt that this is a great and certain improvement. The occupants for the most part are immigrants, many of whom are infected with bilharzia. They are now settled in orderly, simply-designed villages, giving access to light and air, and placed at such a distance from the nearest canal that although a supply of domestic water is within easy reach, the villagers will not make a special journey to foul the canal banks and water.

2. The removal of permanent villages is more difficult. To allow no new house to be built on the canal side of the village offers a solution in many cases.

During the year two permanent villages were given a new lay-out. Blocks were marked out for building, and houses near the canals were moved.

3. The installation of pit latrines between permanent villages and the canals. Those villages known to be endemic foci of bilharzia have been provided for first.

21 new pit latrines have been installed during the year, making a total of 81 in the Gezira area.

But whatever be done, canal water can never be regarded as safe, and a return to the relatively pure water supply of wells for domestic purposes is to be encouraged.

## WAD MEDANI.

(Population 33,000.)

As shown in the following table the number of cases of dysentery admitted to hospital has been falling during the last few years; this probably reflects the improvements in general sanitation, the provision of a pure water supply, and the control of fly breeding :—

Admissions to Hospital.									
1930	...	...	...	...	...	...	...	...	201
1931	...	...	...	...	...	...	...	...	261
1932	...	...	...	...	...	...	...	...	185
1933	...	...	...	...	...	...	...	...	168
1934	...	...	...	...	...	...	...	...	131

10 cases of enteric fever were admitted (11 in 1933) 8 of these cases drew their water supply from canals, 2 direct from the Nile or the piped town supply.

**Conservancy.** The programme for the replacement of bucket latrines by deep pit latrines has been continued. A further 80 conversions were carried out during the year.

198 new pit latrines have been installed in private houses, making a total of 983.

Thus it will be seen considerable progress has been made towards the ideal of a pit latrine to every compound.

Chiefly owing to the impermeability of the soil, bore-hole latrines have not proved a success, and have been discontinued.

**Water Supply.** A piped supply to the town was installed two years ago.

Early in the year, samples did not give good results and various adjustments in the filtration process were made. Further tests showed that the supply was of a high standard of purity.

There are nine standards in the town where pure water is sold, but much water is still drawn direct from the river by donkey boys. These water sellers report weekly for inspection of their water holders, and are allowed to draw water only at special points along the river bank.

**Mosquito prevention.** Again river pools are shown to be the principal source of mosquito breeding in the Wad Medani area.

The embankment along the foreshore was lengthened and strengthened but proved insufficient to prevent the abnormally high river sweeping over and flooding the lowlying area in the vicinity.

Three forest areas were also heavily flooded and in spite of extensive oiling and draining, these areas were undoubtedly the origin of many adult mosquitoes found in Wad Medani town.

### (c) ATBARA.

Population 19,757.

**Malaria.** The Nile flood was late, of short duration and abnormally high.

The exceptional flood caused extensive inundation of low lying areas and it was feared that this would result in an early increase of malarial infections.

A protecting bank was built to the north of the railway cantonment but fortunately the water did not rise to this level.

Owing to the sudden fall of the river and the rapid drying out of flooded areas, mosquito breeding was kept under control and the incidence of malaria for the year was actually lower than formerly.

**Fly borne Diseases.** Flies were very prevalent during the latter part of the year. The flooding of areas which had been used as animal compounds was probably partly responsible.

Six cases of typhoid fever were admitted to hospital, two of whom were from Atbara town.

The incidence of dysentery was greater than last year.

The following table shows the admissions to hospitals :—

					1933	1934
					<hr/>	<hr/>
Amoebic Dysentery	...	...	...	European	3	2
				Native	26	86
Bacillary Dysentery	...	...	...	European	0	2
				Native	2	3
					<hr/>	<hr/>
TOTAL		...	...	...	31	93
					<hr/>	<hr/>

Of the dysentery cases seen in outpatients 80 % were amongst Egyptian residents.

Fly breeding is a difficult problem in this thickly populated centre.



There has been a very great advance in the general sanitation of the town during the past few years. Further improvement is anticipated from an extension of the area controlled by district headquarters to a radius of five miles from the centre of the town.

Additional public latrines on the outskirts would greatly assist in preventing fouling of the ground and the consequent introduction of flies within the residential area.

**Conservancy.** The single bucket system with bucket clearance once or twice in twenty-four hours works satisfactorily.

Bucket replacements have been reduced owing to the use of crude fuel oil, which in addition to acting as a deodorant, preserves the surfaces from corrosion.

The single bucket system is economical in that there is no transport of buckets and less damage is done.

No new public latrines have been erected during the year.

Villages adjacent to Atbara are provided with auger bore latrines.

These worked reasonably well, provided they were not used as refuse dumps.

**Water Supply.** Drinking water is obtained from the Nile and is sedimented and chlorinated, but not filtered. The settling tanks are too small for the amount of water required with the result that during the flood the water is occasionally muddy.

It is generally necessary to pass the water through zeers or filters before drinking.

Laboratory tests show the water to be of a satisfactory standard.

## (d) PORT SUDAN.

Population 19,000.

Port Sudan in common with the rest of the Red Sea littoral is non-malarious. The most difficult sanitary problems of the town are the limitation of fly breeding and the disposal of sewage.

There was an increase in the number of cases of dysentery during the year.

							Amoebic.	Bacillary.
1933	...	...	...	...	...	...	29	33
1934	...	...	...	...	...	...	52	47

Following the increased fly breeding which usually occurs during the wet weather, infantile diarrhoea was again prevalent and proved a serious cause of mortality.

34 children of ages ranging from four months to five years, died from diarrhoea. 44% of the deaths occurred in November and December.

There were 23 admissions to hospital with a mortality rate of 20%.

## CONSERVANCY.

**Water borne systems.** Further additions were made during the year. Septic tanks now total 45, cesspits with water closet connections 63.



One of the difficulties in the past has been to avoid overloading the effluent tanks and at the same time to maintain a frequent and effective flush.

Percolation through the coral is slow and in some installations periodic pumping and removal of the effluent has been necessary. Where space is available the difficulty has been overcome by increasing the effective tank capacity. This has been carried out successfully at the hotel, and at one of the two public latrines on the East Quays.

In the case of the other it is still necessary to pump out the effluent from time to time.

The smaller installations give rise to no trouble.

On the whole these septic tanks and cess pits have proved very satisfactory and their number would be considerably increased were it not for the high level of the subsoil water and the undesirability of this water becoming fouled.

In 1931 observations were made at Suakin to discover to what extent bacteria can pass through coral that is freely permeable to water.

Shallow wells were dug near the effluent pits and the water in them was examined bacteriologically and chemically to discover if they contained any of the bacteria or other contamination from the effluent pits. It was found that at distances of 11 to 45 yards from the pits these wells were all contaminated, but in no case were pathogenic bacteria found.

In the presence of large dilutions of brackish subsoil water and the free communication of the latter with the sea it is unlikely that such contamination, if it exists in Port Sudan, constitutes a serious menace to public health.

**Bucket and Pit Latrines.** The rest of the town and the surrounding villages are served by a double bucket system with the exception of one village which is served by deep pit latrines.

Seven new pits were dug during the year.

The bucket system is working satisfactorily.

The buckets are removed by motor transport and their contents buried in shallow trenches at the edge of the coral tableland on which Port Sudan is situated.

## **MOSQUITOES.**

The mosquito incidence was much the same as in previous years.

The bulk of the infestations found were *stegomyia* and *culex*.

Adult anopheline mosquitoes are very rarely found.

Apart from the preventive measures taken, anopheline mosquitoes do not seem to thrive at Port Sudan and those that hatch out quickly die.

## **RATS.**

Every effort is made to keep down the rat population to a low level. All warehouses are as far as possible ratproofed or made unsuitable to the harbourage of rats. Every effort is made to prevent any food or drink being available for rats in the vicinity of the quays. Communication with ships is adequately guarded against.

The number of rats caught during the year has increased by 250.

A comparison of the total number of the rats caught in the last seven years is as follows :—

In 1928 there were 4,807 rats caught..

„ 1929	„	„	3,491	„	„
„ 1930	„	„	5,184	„	„
„ 1931	„	„	4,630	„	„
„ 1932	„	„	6,885	„	„
„ 1933	„	„	6,454	„	„
„ 1934	„	„	6,705	„	„

of the 6,705 rats caught during the past year.

22.9% were rattus rattus rattus.

54.4% „ rattus rattus frugivorus.

22.7% „ rattus rattus alexandrinus.

**Rat Fleas.** The flea census per month together with the prevailing atmospheric conditions were as follows :—

MONTH.	Fleas per rat.	Average Temperature Shade.		Average Relative Humidity.
		Maximum °C.	Minimum °C.	
January ... ..	1.0	27.2	19.9	70.3
February ... ..	2.4	25.8	18.5	66.1
March ... ..	1.6	28.6	19.2	71.8
April ... ..	1.9	32.3	21.3	55.6
May ... ..	1.2	34.8	25.0	56.9
June ... ..	1.1	40.0	27.4	39.8
July ... ..	0.5	40.6	27.9	40.3
August ... ..	0.4	41.1	29.6	40.7
September ... ..	1.1	38.6	26.6	44.4
October ... ..	0.7	34.4	24.9	64.0
November ... ..	0.9	30.8	23.4	70.6
December ... ..	0.7	27.8	22.0	67.3

It will be seen that the maximum number of fleas per rat was found when the average maximum temperature was 25.8 and the average relative humidity 66.1, the minimum when the temperature was 41.1 and the humidity 40.7.

## WATER SUPPLY.

The water supply of the town is from Khor Arbaat, a natural subsoil reservoir in the hills 20 miles from Port Sudan.

No new constructional work has been done during the year, and the quality of the water continues satisfactory.



### (e) GEBEL AULIA.

From the beginning of the year work on the dam increased and the hospital and the public health service were working at full pressure until the end of July. With the rise of the river, work ceased almost entirely, Saidi labourers returned to Egypt, and most of the officials proceeded on leave.

Dam construction recommenced towards the end of October, but little work was done until December owing to the height of the river. The bulk of the Saidis returned in that month.

The present working population of the colony consists of approximately 5,000 people.

The total population of the area, including adjacent villages amounts to just over 8,000.

#### **Fly Borne Disease.**

A total of 37 cases of dysentery were treated during the year. Five of these were bacillary, and two of these five occurred in British patients.

One of the latter, from whom a strain of the Shiga bacillus was isolated, proved fatal.

All cases of amoebic dysentery occurred in Sudanese. All were mild and most of them relapses of previous infections.

#### **Ancylostomiasis.**

The disease was one of the chief causes of invaliding and loss of work amongst Egyptian labourers.

Routine treatment with carbon tetrachloride is carried out on all Saidis passing through Wadi Halfa quarantine.

In spite of this, out of 200 faecal examination made at Gebel Aulia 25% were found to be infected.

#### **Cerebrospinal Meningitis.**

81 cases occurred between March and July. The disease was probably introduced from Kordofan by Arabs in search of employment.

Nearly every case occurred amongst those living inside huts or tents, under crowded and ill-ventilated conditions.

It is also noteworthy that the majority of those infected were employed in the loading and mixing of sand and cement.

No case occurred amongst the Saidis.

The usual measures of control were adopted and the epidemic was finally terminated by the onset of the rains in July.

#### **Conservancy.**

The concentration of a large mixed population in a limited area and the incidence of ancylostoma and other intestinal infections amongst the Egyptian labourers, calls for a high standard of sanitation, if outbreaks of disease are to be avoided.

Within the area of the dam three different methods of conservancy are adopted.



The double bucket system serves the residential area and the east bank. It is also employed in the vicinity of the actual work.

Single and double seater latrines are installed at various points and are portable, so that they can be moved as the work progresses.

14 seater trough latrines are in use in the Saidi camp. They are flushed by a 40 gallon tank.

The effluent after passing through a series of pits is pumped out and disposed of in the neighbourhood of the sewage farm.

Pit latrines are installed in the adjacent villages.

### **Mosquito Control.**

In addition to the dam site, ten kilometres of the river is controlled on both banks. Of 741 infections found, 416 were anopheline, 322 culex and 3 stegomyia.

The largest number of anopheline were found in October.

The incidence of primary malaria was low. Of 222 cases of malaria treated, only 8 could be regarded as primary infections.

### **Water Supply.**

Water supply for the colony is provided for as follows :—

Water is pumped from the middle of the river on the upstream side of the dam to a reservoir of 100,000 gallons capacity. 2,400 gallons are pumped daily from this reservoir to a Patterson plant which supplies the residents of the colony with drinking water.

A second pipe from the reservoir supplies the Saidi camp where two 750 gallon distribution tanks have been installed.

These are treated daily with chloramine.

On the west bank the supply is from wells.

Water is pumped into tanks which are treated by the same method.

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## **VITAL STATISTICS.**

### **POPULATION.**

Population figures in native cities and towns can only be approximate. The people are naturally suspicious of the reasons for taking a census ; they fear extra taxation etc. and withhold accurate information. It is especially difficult to obtain figures for women and children.

The method commonly adopted is first to take a census by house to house visits.

This figure is checked by taking the previous year's figure and correcting it with the births and deaths for the year.

A third check is made by taking a 100 houses of each type, the number of occupants being well known to the authorities. An average is arrived at, and the total number of houses of each type is multiplied by this figure.

In most large towns there is a large floating population but under normal conditions immigrants probably balance emigrants, and the numbers are not likely to vary very much from year to year.

When compulsory vaccination was carried out in Omdurman two years ago, it was found that the population was somewhat over estimated. This is not surprising, seeing that many people would have been deterred from visiting the town, others would have left it on account of the smallpox epidemic. Though the methods adopted are necessarily crude and the results only approximate, population figures do not vary greatly from year to year, and they have some value in estimating the incidence of disease in relation to the population at risk.

## BIRTHS AND DEATHS.

There is considerable improvement in the recording of births and deaths now that the Assistant Medical Officers in charge of dispensaries are the local registrars for districts. These registers are forwarded to a central registry in Khartoum for future reference. In most provinces returns are still very incomplete, and it is only safe to draw conclusions from those in Khartoum and the northern Sudan.

The returns of births and deaths can only be considered to be in any way correct in Khartoum, Berber and Dongola Provinces and in Wadi Halfa District. The returns for the Blue Nile Province are still very incomplete; they are included in the list given below, but it would not be safe to draw any conclusions from them :—

### NON-EUROPEAN VITAL STATISTICS.

PROVINCE.	1931		1932		1933		1934	
	Total.	Rate.	Total	Rate.	Total.	Rate.	Total.	Rate.
<b>Khartoum :—</b>								
Births ... ..	5071	20.3	4959	17.8	5147	20.4	4013	16.2
Deaths ... ..	2862	11.4	2399	8.6	2857	11.3	2470	9.9
Still births ...	202	39.8	163	32.8	130	25.2	129	32.1
Infantile mortality	405	79.8	287	57.8	428	83.1	298	74.2
<b>Berber :—</b>								
Births ... ..	6275	41.4	5721	34.5	6606	37.7	3830	22.7
Deaths ... ..	3004	19.7	2878	17.3	4031	23.0	2385	14.1
Still births ...	112	17.8	95	16.6	126	19.1	48	12.5
Infantile mortality	526	83.8	474	82.8	565	85.5	257	67.1
<b>Dongola :—</b>								
Births ... ..	6732	41.2	6005	37.9	6187	33.0	5118	32.4
Deaths ... ..	3029	18.8	2729	17.1	3050	16.2	2334	14.7
Still births ...	344	51.1	335	55.7	268	43.3	205	40.0
Infantile mortality	620	92.1	623	103.7	581	93.9	270	52.8
<b>Blue Nile :—</b>								
Births ... ..	18306	51.9	10255	20.6	5647	11.1	6558	13.2
Deaths ... ..	9908	28.0	5948	11.9	4106	8.1	3985	8.0
Still births ...	402	21.9	186	18.1	98	17.3	60	9.1
Infantile mortality	900	49.1	637	62.1	430	76.1	390	59.4
<b>Wadi Halfa Merkaz :—</b>								
Births ... ..	904	21.9	785	15.0	765	11.9	816	13.4
Deaths ... ..	494	11.8	460	8.7	567	8.8	628	10.3
Still births ...	4	4.4	10	12.7	14	18.3	14	17.1
Infantile mortality	124	137.1	120	152.8	163	213.0	127	155.6



Shows the births, deaths by ages and still births of Khartoun, Berber, Blue Nile and Dongola Provinces, and of Wadi Halfa Merkaz,  
which are considered to be approximately correct.

NATIONALITY.	Births.		Deaths by ages.							Total deaths.		Total still births	
	Male.	Female.	Under 1 year	1-5	5-10	10-20	20-40	40-60	Over 60	Male	Female	Male	Female
British ... ..	3	2	1	—	—	—	2	3	—	5	1	—	—
Greek ... ..	18	14	3	—	—	1	—	4	4	11	1	1	—
Other Europeans	1	9	1	2	—	—	—	1	1	3	2	—	—
Egyptians & Syrians	209	180	28	19	1	4	12	10	26	60	40	8	2
Natives of Sudan	10168	9202	1299	2276	734	689	1995	1450	2905	5744	5604	281	159
All others ...	355	221	15	47	13	25	87	88	79	215	139	4	2
Total ... ..	10754	9628	1347	2344	748	719	2096	1556	3015	6038	5787	294	163
Grand Total...	20382		11825							11825		457	
% deaths by ages..			11.3	19.8	6.2	6.0	17.7	13.1	25.4				



## MATERNITY AND CHILD WELFARE.

### MATERNAL MORTALITY.

It is only in the towns where the population is entirely served by trained midwives that it is possible to obtain reliable statistics regarding the complications of child birth and puerperal mortality.

The following figures are compiled from the returns of the Civil and Church Missionary Society's hospitals in Omdurman, from the Midwifery Training School and the trained town midwives of Omdurman. Though these figures cannot be taken as typical of the country as a whole, they give some indication of the complications of pregnancy and child birth conducted under the best available conditions :—

<b>Total Cases</b>	...	...	...	...	...	...	...	...	940
Abnormal	...	...	...	...	...	...	...	...	170
Died	...	...	...	...	...	...	...	...	11
<b>Births</b>	...	...	...	...	...	...	...	...	883
Alive	...	...	...	...	...	...	...	...	846
Still born	...	...	...	...	...	...	...	...	37
<b>Complications and Cause of Death.</b>						<b>Total.</b>	<b>Recovered</b>	<b>Died.</b>	
Abortions	...	Septic	...	...	...	7			
		Others	...	...	...	82			
						89	86	3	
Puerperal Sepsis	Normal Labour	...	...	...	17				
	Abnormal „	...	...	...	10				
					27	25	2		
Puerperal Haemorrhage. Placenta praevia	...				6				
	Others	...	...	...	27				
					33	32	1		
Puerperal Albuminuria and convulsions	...				4	3	1		
Other toxaemias of pregnancy	...	...	...	...	2	1	1		
Phlegmasia alba dolens	...	...	...	...	2	2	0		
Embolism	...	...	...	...	1	0	1		
Other Accidents and abnormal conditions of the puerperal state :—									
Obstructed labour	...	...	...	...	30				
Malpresentation	...	...	...	...	17				
Foetal asphyxia	...	...	...	...	3				
Severe laceration	...	...	...	...	7				
Retained placenta	...	...	...	...	3				
Acute mastitis	...	...	...	...	3				
Puerperal insanity	...	...	...	...	2				
Hydatidiform mole	...	...	...	...	1				
Ischio rectal abscess	...	...	...	...	1				
Vesico vaginal fistula	...	...	...	...	1				
					68	67	1		
Illnesses complicating but not directly due to pregnancy	...	...	...	...	32	31	1		
Pregnancy terminated as result of illness	...				5	—	—		

## INFANT MORTALITY.

The infant mortality rate for the three towns Khartoum, Khartoum North, Omdurman was approximately 85 per 1,000 live births.

The following table show an analysis of the principal causes of 271 infant deaths and 508 deaths in children aged 1-5 years.

### Infant Deaths (0-1 year) :—

CAUSE OF DEATH.					No. of deaths	% of total.
Debility and malnutrition	...	...	...	...	39	} 26.20
Prematurity	...	...	...	...	32	
Diarrhoea and enteritis	...	...	...	...	60	22.14
Pneumonia and bronchitis	...	...	...	...	54	19.93
Fever (including malaria)	...	...	...	...	45	16.61
Zymotic diseases	...	...	...	...	23	8.49
Other causes	...	...	...	...	18	6.63
TOTAL					271	100.00

### Deaths in Childhood (1-5 years) :—

CAUSE OF DEATH.					No. of deaths	% of total.
Fever (including malaria)	...	...	...	...	216	42.52
Diarrhoea and enteritis	...	...	...	...	168	33.07
Pneumonia and bronchitis	...	...	...	...	106	20.87
Other causes	...	...	...	...	18	3.54
TOTAL					508	100.00

In England the three principal causes of infant death have for long been :—

1. Developmental conditions, including injury during birth, prematurity, debility, convulsions, malformations etc.

2. Respiratory diseases.

3. Gastro-enteritis.

In this country many of the infant deaths registered as due to debility and malnutrition are probably cases of prematurity. The two groups are therefore combined.

It is apparent from the above table that the three principal causes of death correspond to those of England.

Deaths due to fever (including malaria) form a large group which is not found in temperate climates.

In a great number of such cases no microscopic diagnosis of the cause of the fever is available.

Amongst the causes of death in children from 1-5 years it is interesting to note that fever (including malaria) takes first place. This is explained by the greater exposure to infection of the older child.



It also explains the relative immunity to malaria of the adult population.

The above tables probably represent fairly accurately the principal causes of infant mortality in the Northern Sudan.

In the south climatic conditions are different and infant deaths due to malaria outweigh all others. Owing to the heavy incidence of mosquitoes infants are liable to infection almost from the day of birth and it is rare to find a child under one year without an enlarged spleen. If they survive they acquire an increasing immunity with age, and cases of malaria in adults are seldom seen.

### CHILD WELFARE AND ANTE-NATAL CLINICS.

The work of these clinics has increased considerably and it has been found necessary to open two new centres during the year near Khartoum, at Gereif and Tuti Island.

There are now nine clinics, situated as follows :—

Atbara	Burri	Wad Medani
Khartoum North	Port Sudan	Tuti Island
Gereif	Midwifery School.	Khartoum Deims

They serve a most useful purpose, and many obstetrical cases requiring special treatment are admitted to hospital, who would otherwise be missed. So much is this so at the Khartoum Civil Hospital that it has become urgently necessary to provide more accommodation for this type of patient, and a number of small wards have been built during the year.

There were 5,325 attendances during the year in the Khartoum Province clinics, compared with 2,428 in 1933. Of these, 1,763 were new cases, nearly 50% of the total number of births reported in this area.

The Senior Physician reports that the personal touch introduced in these clinics between the expectant mothers, the midwives and the hospital staff, makes the women more ready to come into hospital when delay or difficulty in labour arises, before they reach the stage of exhaustion.

There has been a considerable increase in the number of confinements in Khartoum and Omdurman Hospital as a result, and 65 cases were delivered in Khartoum Hospital, and 96 in Omdurman Hospital during the year.

The clinics serve a most useful purpose in these towns which are too large for their work to be undertaken by the female departments of the hospitals.

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### MEDICAL EXAMINATION OF SCHOOLS.

22,751 children were examined and necessary treatment arranged compared with 18,160 in 1933.

The School Medical Service in Khartoum is now fully developed, and the beneficial results are already seen in the improved health of those entering the Gordon College, particularly with regard to eye diseases.

Special attention is being paid to Halfa Province, where the incidence of trachoma among school children is still high.



The following table shows the result of medical examinations in two secondary, one technical, 14 intermediate, 80 elementary and 207 village schools :-

PROVINCE.	Number examined.	Number Trachoma.	Number Bilharzia.	Number Spleen.	Number Pulmonary Tuber- culosis.	Number Ancylos- toma.
<b>Bahr El Ghazal :—</b>						
1 Girls School ...	49	—	—	29	—	—
2 Boys Schools ...	273	—	37	130	—	37
<b>Berber :—</b>						
3 Intermediate ...	220	128	8	38	—	—
3 Girls Schools ...	244	126	1	8	—	—
7 Elementary ...	786	441	25	114	—	—
45 Village ...	1544	630	165	305	—	—
<b>Blue Nile :—</b>						
1 Greek School ...	42	11	—	—	—	—
1 Intermediate ...	42	6	—	13	—	—
9 Elementary ...	294	145	6	134	—	—
3 Girls School ...	271	40	—	24	—	—
69 Village ...	3465	1157	9	1168	—	—
<b>Darfur :—</b>						
2 Elementary ...	228	116	58	112	—	—
2 Village ...	346	249	97	114	—	—
<b>Dongola :—</b>						
8 Elementary ...	945	695	29	118	—	1
<b>Fung :—</b>						
3 Elementary ...	266	76	5	129	—	—
7 Village ...	496	194	6	289	—	—
<b>Halfa :—</b>						
1 Intermediate ...	485	340	180	1	—	47
2 Elementary ...	770	—	241	—	—	—
9 Village ...	2846	1390	420	4	—	—
<b>Kassala :—</b>						
5 Elementary ...	493	53	—	113	—	—
30 Village ...	1535	81	6	404	—	—
<b>Khartoum :—</b>						
Gordon College ...	395	179	1	20	—	—
Teachers Trng. Sch.	40	7	—	1	—	—
Technical School	133	17	2	—	—	—
3 Intermediate	447	75	9	1	—	—
11 Elementary ...	1114	315	—	6	—	—
1 Mission School ...	198	53	—	—	—	—
Unity High School	34	—	—	2	—	—

PROVINCE.	Number examined.	Number Trachoma.	Number Bilharzia.	Number Spleen.	Number Pulmonary Tuber- culosis.	Number Ancylos- toma.
<b>Kordofan :—</b>						
1 Intermediate ...	83	15	2	23	—	—
9 Elementary ...	977	251	215	459	—	—
24 Village ...	944	207	64	306	—	—
<b>Mongalla :—</b>						
2 Intermediate ...	199	24	—	22	—	2
<b>Port Sudan :—</b>						
1 Intermediate ...	96	8	1	4	—	1
5 Elementary ...	646	116	8	16	—	2
1 Village ...	85	7	2	5	—	—
<b>Upper Nile :—</b>						
1 Elementary ...	124	29	—	69	—	—
2 Mission Schools	102	12	—	16	—	—
2 Village ...	82	14	—	20	—	—
<b>White Nile :—</b>						
Teachers Trng.Col.	39	28	—	8	—	—
1 Girls School ...	121	67	—	10	—	—
8 Elementary ...	737	233	26	195	—	—
16 Village ...	515	115	67	205	—	—

## QUARANTINE.

### (a) PORT SUDAN QUARANTINE.

Quarantine measures for cholera were enforced against the Port of Bombay up to 1st November.

The following table shows the number of ships entering the port during the last six years :—

	1929	1930	1931	1932	1933	1934
Ships arriving ...	885	944	879	903	772	890
Sailing Vessels ...	526	529	530	546	423	509
Warships British ...	17	20	18	7	14	15
„ French ...	5	9	4	—	6	6
„ Italian ...	6	3	4	—	—	1
Persons isolated from ships ...	—	2	—	—	1	7
Total Receipts ...	£E. 800	£E. 626	£E. 538	£E. 448	£E. 388	£E. 447

(b) **WADI HALFA QUARANTINE.**

4,021 Egyptian Labourers passed through the quarantine, of whom 27 were repatriated as unfit. 623 were treated for bilharziasis, either at Wadi Halfa or their destination, Gebel Sileitat.

413 were found to be suffering from ancylostomiasis.

(c) **SUAKIN QUARANTINE.**

The number of pilgrims showed an increase on that of the previous year. This corresponded with an increase in the total number of pilgrims arriving at Jeddah. The figures for the last six years are given below :—

	1929	1930	1931	1932	1933	1934
Pilgrims arriving in Hedjaz	166,500	120,000	64,000	60,000	50,000	60,000
Pilgrims via Suakin ...	3,866	4,791	2,414	1,348	970	1,459

Yom el Arafat fell on March 25th, and the last pilgrim ship left Suakin on March 19th.

The first ship from Jeddah with returning pilgrims arrived at Suakin on April 6th with 354 pilgrims.

**Outgoing pilgrims.**

1,459 pilgrims left Suakin for the Hedjaz. They were vaccinated against smallpox, and received a single inoculation against cholera.

The usual deposits were collected.

The dates of departure, and details of race and sex are given below :—

Date of Departure	Sudanese				West Africans				Grand Total
	Men	Women	Children	Total	Men	Women	Children	Total	
9. 1.34 ...	1	—	—	1	10	8	5	23	24
22. 1.34 ...	1	2	—	3	—	—	—	—	3
5. 2.34 ...	4	1	—	5	3	4	—	7	12
19. 2.34 ...	16	4	—	20	26	35	4	65	85
6. 3.34 ...	157	85	2	244	190	184	65	439	683
12. 3.34 ...	80	47	5	132	109	131	52	292	424
19. 3.34 ...	91	24	3	118	25	29	7	61	179
6. 4.34 ...	—	—	—	—	1	—	—	1	1
21. 4.34 ...	1	—	—	1	1	—	—	1	2
4. 6.34 ...	4	—	—	4	1	1	—	2	6
2. 7.34 ...	—	—	—	—	1	—	—	1	1
8.10.34 ...	—	1	—	1	—	1	—	1	2
25.10.34 ...	—	—	—	—	2	—	—	2	2
5.11.34 ...	—	—	—	—	2	4	2	8	8
19.11.34 ...	—	—	—	—	—	2	—	2	2
3.12.34 ...	3	—	—	3	6	3	1	10	13
7.12.34 ...	1	—	—	1	4	1	1	6	7
31.12.34 ...	1	—	—	1	1	2	1	4	5
TOTAL ...	360	164	10	534	382	405	138	925	1459

All left by S.S. 'Talodi' except the batch of 12th March, 1934, who sailed on S.S. 'Bulaq.'



### Returning pilgrims.

A total of 1,571 underwent quarantine. The period of detention was increased to eight days, as two cases of smallpox developed in the first batch of pilgrims. Both cases were in the same section.

All occupants of this section were re-vaccinated, and no further cases occurred. The following table gives the dates of departures from Jeddah, and the race and sex of the returning pilgrims :—

Date	Sudanese				West Afr cans				Grand Total
	Men	Women	Children	Total	Men	Women	Children	Total	
9. 1.34 ...	2	—	—	2	4	4	—	8	10
5. 2.34 ...	1	1	—	2	2	1	—	3	5
6. 3.34 ...	—	—	—	—	1	—	—	1	1
19. 3.34 ...	—	—	—	—	—	—	—	—	—
6. 4.34 ...	198	104	6	308	27	15	4	46	354
21. 4.34 ...	107	45	8	160	81	99	45	225	385
8. 5.34 ...	74	21	1	96	95	89	38	222	318
22. 5.34 ...	—	—	—	—	96	101	35	232	232
4. 6.34 ...	2	2	—	4	12	25	8	45	49
18. 6.34 ...	3	—	—	3	3	5	3	11	14
2. 7.34 ...	8	4	—	12	5	6	4	15	27
16. 7.34 ...	1	6	—	7	—	—	—	—	7
13. 8.34 ...	—	—	—	—	7	9	3	10	19
27. 8.34 ...	1	—	—	1	—	2	—	2	3
10. 9.34 ...	—	1	—	1	1	2	—	3	4
24. 9.34 ...	—	1	—	1	—	1	—	1	2
8.10.34 ...	1	—	—	1	—	—	—	—	1
22.10.34 ...	—	—	—	—	1	1	1	3	3
5.11.34 ...	—	1	—	1	60	49	15	124	125
19.11.34 ...	—	—	—	—	3	3	—	6	6
3.12.34 ...	—	—	—	—	3	1	—	4	4
17.12.34 ...	1	1	—	2	—	—	—	—	2
TOTAL ...	399	187	15	601	401	413	156	970	1,571

All returned by S.S. 'Talodi.'

### Arrivals by Sailing Vessels.

No pilgrims returned to Suakin by sailing vessels.

### Destitute Pilgrims.

9 destitute pilgrims returned by Suakin.

### Health of Pilgrims.

The general health of the returning pilgrims was satisfactory.

There were nine admissions to hospital, with two deaths.

The following table shows the admissions by diseases for the last six years :—

DISEASE.	1929	1930	1931	1932	1933	1934
Anaemia ... ..	—	2	1	—	—	—
Chickenpox ... ..	—	3	—	1	1	1
Confinements ... ..	3	3	—	—	—	—
Diseases of Alimentary System ...	6	8	—	—	2	2
„ „ Circulatory „ ...	1	—	—	—	—	1
„ „ Genito-Urinary „ ...	3	—	—	—	1	—
„ „ Nervous System ...	2	—	—	—	—	—
„ „ Respiratory System ...	3	1	2	—	—	—
Debility and old age ... ..	—	—	—	2	—	—
Dysentery, amoebic ... ..	1	8	2	—	—	—
„ bacillary ... ..	1	—	—	1	1	—
Malaria ... ..	2	7	2	—	1	2
Pneumonia ... ..	2	6	2	2	—	1
Scabies ... ..	—	2	1	—	—	—
Smallpox ... ..	—	—	—	—	—	2
Syphilis ... ..	—	1	—	—	—	—
Typhoid Fever ... ..	1	—	—	—	—	—
Wounds and Injuries ..... ..	4	6	—	—	—	—
TOTAL ... ..	29	47	10	6	6	9
Deaths ... ..	6	9	4	—	2	2*

\* Cause of Death—1 pneumonia, 1 infant, overlaid.

## Quarantine Dues.

£E. 4.050 m/ms. is paid in advance by a pilgrim wishing to leave Suakin.  
This sum is made up as follows :—

	£E. m/ms.
Return steamer fare ... ..	1.400
Hedjaz quarantine dues ... ..	1.850
Sudan consolidated charges ... ..	0.800

The Sudan consolidated charge is made up as follows :—

	£E. m/ms.
Quarantine dues (including landing charges etc.) ... ..	.500
Passport ... ..	.050
Food ... ..	.100
Cash to be handed to pilgrim on discharge from quarantine	.150

## Payment of Quarantine dues by West Africans.

YEAR.	Full dues paid.	Half dues paid.	No dues paid.	Total.
1929 ... ..	1839	216	258	2331
1930 ... ..	2252	220	399	2871
1931 ... ..	1176	117	63	1356
1932 ... ..	785	43	100	928
1933 ... ..	327	14	48	389
1934 ... ..	701	63	206	970

## Total Quarantine Dues Paid.

	£E.
1929 ... ..	1,692
1930 ... ..	1,707
1931 ... ..	1,028
1932 ... ..	682
1933 ... ..	318
1934 ... ..	695



## OPHTHALMIC REPORT

35 male (with a potential increase to 47) and 20 female beds are provided in the River Hospital; maximum total 67.

					River Hospital.	Omdurman.	Total
Inpatients	...	...	...	...	305	21	326
Outpatient attendances	...	...	...	...	13,983	32,962	46,945
Operations	...	...	...	...	210	35	245

Outpatient attendances at the River Hospital tabulated according to diseases :—

DISEASES.								Number.
Trachoma	...	...	...	...	...	...	...	4,310
Conjunctivitis		...	...	...	...	...	...	4,527
Cataract	...	...	...	...	...	...	...	400
Glaucoma	...	...	...	...	...	...	...	934
Wounds and Ulcers	...	...	...	...	...	...	...	1,125
Pterygia	...	...	...	...	...	...	...	575
Foreign Bodies...	...	...	...	...	...	...	...	349
Trichiasis	...	...	...	...	...	...	...	638
Minor Operations	...	...	...	...	...	...	...	405
Vision Testing	...	...	...	...	...	...	...	394
Refractions	...	...	...	...	...	...	...	326
TOTAL				...	...	...	...	13,983

### TRACHOMA.

The majority of cases are dealt with in the outpatient department but severe cases complicated by iritis, marked pannus, keratitis and ulceration are admitted to hospital.

Admitted to hospital ... .. 58

4,310 attended for trachoma treatment in the outpatient department.

The majority of trachoma patients report at the outpatient department with acute conjunctivitis complicating trachoma and the method of treatment carried out is as follows :—

**Children**—with muco-purulent discharge and oedematous lids. Irrigation with Lotio Acid Boric (3%) and Zinc Sulphate (2%). Installation of Silver Nitrate drops (1%) and Ung. Hydrarg Ox. Flav. (1%) with Atrophine (1%) twice a day for three days. Generally by this time the acute symptoms have subsided and then if trachoma is present, anti-trachoma treatment is instituted.

**Adults**—depending on the severity of the conjunctival symptoms, painting the lids with Silver Nitrate (1%) or instillation of drops together with Ung. Hydrarg Ox. Flav. (1%). If symptoms of iritis are present, instillation of Ung. Hydrarg Ox. Flav. (1%) with Atropine (1%) after preliminary irrigation with Lotio Acid Boric and Zinc Sulphate.

#### Using MacCallan's Classification.

**Trachoma I.** Painting lids daily with following preparation:—

- 1st Day—Copper Sulphate (2% in glycerin).
- 2nd Day—Chaulmoogra Oil.
- 3rd Day—Zinc Sulphate (2% in glycerin) and repeat. Irrigation with Lotio Acid Boric and Zinc Sulphate before and after painting. Instillation of Ung. Hydrarg Ox. Flav. after painting.

**Trachoma II.**

- 1st Day—Copper Sulphate (10% in glycerin).
- 2nd Day—Chaulmoogra Oil.
- 3rd Day—Zinc Sulphate (10% in glycerin) and repeat.

Some cases are treated daily for a week with Copper Sulphate, 10% only, followed by the above treatment. If the reaction is severe Ung. Hydrarg Ox. Flav. (1%) with Atropine (1%) is employed. In certain cases with large gelatinous follicles and papillary enlargement, the lid is painted for the first three or four days with finely powdered Sodium Chloride applied by means of cotton wool dipped in glycerin. Painting of the lids with Copper Sulphate and Chaulmoogra Oil follows.

**Trachoma III.** Copper Sulphate 2% etc. as severity of case demands.

#### VERNAL CATARRH.

2 cases were complicated by trachoma and diagnosed from the eosinophilia in the conjunctival secretion.

#### CONJUNCTIVITIS OTHER THAN TRACHOMA.

4,527 attended the outpatient department.

30 were admitted to hospital. \* Severe purulent or mucopurulent discharge was present in these cases. In several the Koch-Weeks bacillus was demonstrated. Five were of gonorrhoeal origin, one of the latter being a case of ophthalmia neonatorum with perforation and prolapse of the iris in one eye and commencing ulceration in the other. Fortunately vision was saved in one eye. Morax-axenfeld bacilli were found in several of the almost mucopurulent conjunctivitis cases.

#### PHLYCTENULAR CONJUNCTIVITIS.

This condition is fairly common among children.



## LID DISEASES.

Attendances	...	...	...	...	...	...	...	1,043
Minor Operations	...	...	...	...	...	...	...	405
Trichiasis	...	...	...	...	...	...	...	638
Major Operations	...	...	...	...	...	...	...	23

Most of the trichiasis and entropion cases were treated as outpatients but some with still active trachoma were admitted to hospital for treatment preliminary to operation.

Six cases were admitted.

The operation found most successful was double transplantation.

## PTERYGIA.

Attendances	...	...	...	...	...	...	...	575
Operations	...	...	...	...	...	...	...	34

Three of the patients admitted had only one useful eye.

Pterygia are common and are treated as outpatients. McReynolds operation is the one of choice.

## DISEASES OF LACRYMAL APPRATUS.

Admission 8. 4 acute and 4 chronic cases were operated upon.

## DISEASES OF CORNEA.

Most of the corneal complications seen were sequelae of trachoma but marginal ulcers were common in the late mucopurulent conjunctivitis cases.

12 cases of adherent leucomata were admitted for which optical iridectomy could be performed. 4 cases of staphylomata were admitted for treatment; two agreed to enucleation and in two cases an attempt was made to reduce the bulging of the eye by means of trephining. The results on discharge were fairly good but it was not possible to follow them up to see if phthisis bulbi ultimately developed.

## MOOREN'S ULCERS.

Two were admitted and the actual cautery applied to edges. On discharge advancing edges appeared to be arrested and certainly symptoms were alleviated.

## INTERSTITIAL KERATITIS.

Four cases were admitted to hospital Khan test + + + +. One of these cases, a policeman, had already undergone a course of injections for syphilis. During a period of three months he had received 4.2 grams of Novarsenobenzol and 2.6 grams of Bismuth.

Ten further cases admitted. Khan test was negative on three consecutive weekly blood tests.

## CATARACTS.

60 uncomplicated cataracts were admitted to hospital and were operated upon. The majority of these were over ripe. 4 cases of congenital cataract, or cataracts in babies, and 8 traumatic cataracts were similarly dealt with.

## Cataracts Complicating Glaucoma.

In 7 cases preliminary iridectomy was performed and cataracts were extracted later.



## **GLAUCOMA.**

30 cases were admitted for operation. Better results are being obtained by technically correct iridectomy than by Elliott's corneo-scleral trephining. In the latter operation there appears to be a tendency for the filterable scar to be choked later with exudate.

## **ACUTE GLAUCOMA.**

2 cases. Both seen before in subacute stage but at that time would not agree to come into the hospital.

## **RETINAL AND CHOROIDAL CONDITIONS.**

2 cases of retinal detachment were seen and only one would come into hospital. No retinal tear could be located.

One case of retinitis pigmentosa ; Khan test negative, urine, faeces etc., negative.

One case of albuminuric retinitis was admitted to hospital.

## **OPTIC NERVE.**

4 cases of double optic atrophy. Two, Kahn test positive with history of two injections of Novarsenobenzol. One child of 11 years had a history of having been struck on the head with a heavy stick by another child ten months ago ; vision gradually failed in a month and ended in complete loss.

## **PENETRATING INJURIES OF EYE.**

Prolapse of iris in 10 cases.

## **TUMOURS.**

1 melanotic sarcoma.

1 large granulating papilloma of socket.

1 round-celled sarcoma in a child of 2 years. Excentration of orbit-recurrence of rapid growth in one month and death of child. History of earlier child of same family dying of similar complaint 2 years before.

## **INVESTIGATION INTO ONCHOCERCAL KERATITIS AND " SUDAN BLINDNESS " IN BAHR EL GHAZAL PROVINCE.**

In late February, 1934 I was able to visit the Bahr-el-Ghazal Province to assist Dr. Bryant in his investigations. Unfortunately the rains had ended earlier that year and we had great difficulty in collecting cases. The various afflicted tribes were widely scattered in search of grazing and food and the majority of cases seen were of old standing.

All the cases of onchocercal keratitis showed tumours containing filaria or thickening of the skin with microfilaria in the smears obtained on puncture.

Almost all the cases I saw of " Sudan Blindness " also showed onchocercal manifestations.

Aspiration of the aqueous in all of 20 cases of onchocercal keratitis showed microfilaria in the fluid. In " Sudan Blindness " (6 cases) no anterior eye manifestations were present ; aqueous was negative. In 8 cases of onchocerciasis with no eye lesions aqueous was negative. In one case of " Sudan Blindness " of the right eye, in which secondary atrophic disc and marked retino-choroiditis with involvement of macula was present, a fine threadlike body with a curled up extremity was seen crossing the disc. It appeared very similar in appearance to a small male filaria but we were unable to confirm this.

## YELLOW FEVER.

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Systematic investigations have been carried out by Dr. Hewer of the Wellcome Tropical Research Laboratories in co-operation with the medical staff in the provinces concerned. These consisted of collection of sera from all suspected districts, which were examined by the Rockefeller Laboratories, New York, by the biological test, and the examination of liver sections from post-mortems carried out in these areas or obtained by means of the viscerotome.

**Results of Biological Tests.** The survey of the southern and western Sudan by the biological test has recently been completed. It showed that although protection was given by blood sera from adults in many parts of Darfur, Kordofan, Bahr el Ghazal and Mongalla Provinces, protection in young children was only found in Wau District of the Bahr el Ghazal Province where two children aged 6 and 9 respectively, out of 24 tested, showed protection. The only other districts where protection was found in children under the age of 12 were Rumbek, where one child aged 11 was protected, and Juba, where the ages of three children previously estimated at 12 are now considered to have been over-estimated.

**Results of Pathological Examination of Liver Sections.** This examination is being carried out as thoroughly as possible, and orders have been given that wherever possible liver sections should be obtained in all fatal febrile cases of under ten days' duration.

In July, 1934, a liver with the pathological changes of yellow fever was obtained from Wau, and the clinical history of the case resembled that of yellow fever.

In consequence the following precautions were taken as regards aircraft :—

1. All aerial navigation to other territories has been prohibited from any aerodrome in Bahr el Ghazal Province in accordance with the International Sanitary Convention for Aerial Navigation.
2. Aerodromes in Bahr el Ghazal Province have been closed to all civil aircraft flying within the Sudan.
3. Juba and Malakal have been made to conform to the requirements of anti-amaryl aerodromes, although there is no reason to believe that yellow fever exists in these districts at present.
4. The sanitary staff at Wau has been increased in order that every effort shall be made to eliminate the mosquito vector.



## PROGRESS OF WORK.

The following figures show the number of inpatients, outpatient attendances and operations performed during the last eleven years :—

YEAR.	Admissions to Hospital.	Outpatient Attendances.	Operations Performed.
1924 ... ..	19,827	394,418	2,099
1925 ... ..	22,809	593,014	2,565
1926 ... ..	28,034	1,024,848	3,027
1927 ... ..	33,407	1,457,706	3,445
1928 ... ..	39,965	2,004,283	3,913
1929 ... ..	46,033	2,675,085	4,337
1930 ... ..	49,911	3,840,923	6,110
1931 ... ..	59,763	4,044,439	6,798
1932 ... ..	59,642	4,264,412	7,287
1933 ... ..	70,315	5,092,999	8,609
1934 ... ..	85,990	6,039,197	10,082

The number of dispensaries has steadily increased during the last ten years, and it is anticipated that when the new dispensaries approved in 1935 are opened, the network will be more or less complete. About three hundred dispensaries, and their ancillary services of dressers or Sanitary Barbers will bring treatment within reasonable distance, act as an excellent system of medical intelligence, deal with outbreaks at once, and supervise the sanitation and antimalarial work of their districts.

Regarding hospitals, a large addition has been made to the number of beds available during the last three years ; the southern provinces have now been brought into line in this respect. There are 4,913 beds of various categories in use at present, and it is anticipated that in the near future the number of beds will be raised to over 5,000, *i.e.*, to the standard of 1 per 1,000 of the population.

There are in addition about 150 beds in mission hospitals.

The work continues to increase, and is approaching the maximum which can be dealt with by the existing staff and accommodation.

This increase is particularly marked among the women of the northern Sudan who previously have always been very reluctant to report sick, or to enter hospital.

The sudden increased demand for beds for female patients has necessitated urgent ward extensions in four northern hospitals.

Considerable progress has been made in preventive medicine. Sanitary services have been augmented, especially in the southern Sudan.



The difficult problem of village sanitation has been tackled. In the irrigated area of the Gezira, 94 villages have been re-sited to avoid pollution of the canals and 81 village public pit-latrines were constructed.

12 wells have been dug in villages near the river in White Nile Province, to provide a safer water supply than the river.

Efforts are being made to improve the general cleanliness of the villages ; attention is being paid to tribal diets, and in certain districts an attempt has been made to improve them.

Much remains to be done, and it is intended that the development of medical work in the near future will be on the preventive rather than on the curative side with more lasting, if less dramatic, results.

## BUILDINGS.

(a) The usual minor alterations and additions were made.

In addition the following new buildings have been completed during the year :—

Huts or wards at :—

Talodi (Kordofan)	...	...	...	...	...	...	6
Tegali „	...	...	...	...	...	...	2
Kauda „	...	...	...	...	...	...	2
Gardud „	...	...	...	...	...	...	1
Kosti (White Nile)	...	...	...	...	...	...	4
Opari (Mongalla)	...	...	...	...	...	...	1
Kajo-Kaji „	...	...	...	...	...	...	2
Badein (Dongola)	...	...	...	...	...	...	1
Halengo (Kassala)	...	...	...	...	...	...	1

Five wards at Khartoum.

An operating theatre at Talodi.

Quarantine inspection huts at Malakal and Juba.

A ward, mortuary, and outpatient room at Dongola.

Assistant Medical Officer's house at Tali.

(b) New dispensaries were erected at :—

Shawaia (Kordofan)	Bardana (Fung)
Buram „	Sudda „
Ghulfan „	Saoleil „
Heiban „	Marial Bai (Bahr el Ghazal.)
Ermī „	Madal „
Tira Limon „	Wun-Shwai „
Bakht el Roda (White Nile)	Pongo „
Kosti „	Kuru „
Travelling Dispensary „	Gananita (Berber)
Kayala (Mongalla)	Dikka „
Laffone „	

# MEDICAL WORK CARRIED OUT BY MISSIONS.

## MISSION HOSPITALS.

### (1) Omdurman (Church Missionary Society).

STAFF :—

3 British doctors.  
4 „ nurses.  
1 „ dispenser.  
1 „ secretary.

Beds	...	...	...	...	...	...	...	...	60
Inpatients	...	...	...	...	...	...	...	...	1,346
Outpatients	...	...	...	...	...	...	...	...	51,179
Operations	...	...	...	...	...	...	...	...	207
Abu Ruf Dispensary Outpatients	...	...	...	...	...	...	...	...	12,554

The work continues to increase, and the facilities provided are made full use of. This hospital also undertakes the outpatient treatment of 35 lepers resident in Omdurman.

### (2) Lui, Mongalla Province (Church Missionary Society).

STAFF :—

One British Doctor.

Outpatient cases	...	...	...	...	...	...	...	3,885
Outpatient attendances	...	...	...	...	...	...	...	21,697

This hospital and its dispensaries carry out valuable work. Two bush dispensaries were opened during the year. This organisation is administered on most efficient and economical lines, and is a stimulating example of how much can be done with relatively small resources by enthusiasm, self-sacrifice, and personal effort.

**(3) Melut, Upper Nile Province** (Sudan United Mission).

STAFF :—

One British Doctor.

Inpatients	...	...	...	...	...	...	...	384
Outpatients	...	...	...	...	...	...	...	2,797
Injections	...	...	...	...	...	...	...	590

**(4) Akot, Upper Nile Province** (Church Missionary Society).

STAFF :—

One British Doctor.

**(5) Western Nuer, Upper Nile Province** (Church Missionary Society).

A British doctor is stationed here in charge of a dispensary.

**(6) Moro Hills, Kordofan Province** (Sudan United Mission).

A dispensary has been opened, with a British doctor in charge.

**(7) Nasser, Upper Nile Province** (American Mission).

A small hospital, with a doctor in charge, has been opened.

**MISSION DISPENSARIES.**

- (1) **Khartoum North** (American Mission).
- (2) **Kordofan Province** (Sudan United Mission) at Abri, Heiban and Tabanya.
- (3) **Upper Nile Province** (Italian Mission).
- (4) **Upper Nile Province** (Sudan United Mission) at Rom.
- (5) **Upper Nile Province** (American Mission) at Doleib Hill.



## TRAINING.

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### KITCHENER SCHOOL OF MEDICINE.

#### NUMBER OF STUDENTS.

10 new students were admitted in 1934, the classes being composed as follows :—

Medical Students :—

4th Year	...	...	...	...	...	...	...	...	9
3rd Year	...	...	...	...	...	...	...	...	7
2nd Year	...	...	...	...	...	...	...	...	7
1st Year	...	...	...	...	...	...	...	...	10

Sanitary Students :—

3rd Year	...	...	...	...	...	...	...	...	2
2nd Year	...	...	...	...	...	...	...	...	2

TOTAL	...	...	...	...	...	...	...	...	37
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(NOTE.—One 4th year student was discharged in June, 1934 by the School Council on account of a breach of discipline.)

#### DEATH OF DR. MOHAMED HASSAN.

The death in Kordofan Province on August 28th, 1934 of Dr. Mohamed Hassan robbed the School of one of its most promising graduates. Dr. Mohamed entered the Medical School in 1929 and graduated in 1932 with a very creditable class record. He was a man of great personal charm. During his career at the Medical School he earned the high approval of his teachers and the love and respect of his fellow students. His loss has been most keenly felt.

#### CLASS EXAMINATIONS.

On the recommendation of the Assessors for 1933-34 a system of class examinations was adopted similar to that in force in British medical schools. Examinations were held at intervals throughout the year by the lecturers in their respective subjects. The results were submitted to the Registrar who was empowered to decide whether or not a student's performances in his classes were of a sufficiently high standard to warrant his being allowed to sit the professional examinations. On the reports thus received two 1st year students were disqualified and were discharged.

## PROGRESS OF CLASSES.

Professional Examinations were held in 1st., 2nd, and final year subjects.

### 1st YEAR EXAMINATION RESULTS.

Eight candidates were examined in Chemistry, Physics and Biology. Of these six students reached the required standard and will continue their medical studies. Two students failed to reach the standard required for medical students but were accepted for training as Sudanese Sanitary Officers.

### 2nd YEAR EXAMINATION RESULTS.

Seven candidates were examined in Anatomy and Physiology. Of these five candidates passed in both subjects and will proceed with their classes. One student failed in Physiology and was referred back for a further year. One student failed in both subjects and was accepted for training as a Sudanese Sanitary Officer.

## FINAL EXAMINATIONS.

The School was fortunate in obtaining the services of Mr. Hugh Lett, Senior Surgeon to the London Hospital, and Dr. Harold B. Day, Professor of Medicine, Egyptian University, as assessors in Surgery and Medicine respectively.

Nine candidates were examined in Surgery, Medicine, Midwifery, Gynaecology, Pathology, Public Health, Forensic Medicine, Psychiatry and Pharmacology.

All candidates were successful and will be posted to the larger hospitals of the Sudan as House-Surgeons and House-Physicians for one year on probation.

The successful candidates were (in order of merit).

Ibrahim Mohd. El Maghraby—*Passed with distinction.*

Mohamed Hamad Satti.

Mohammed Rashad Farid.

Tigani Mohamed El Mahi.

Osman Rahmi.

Mohd. Abdullahi El Awad.

Abbas Hamad Nasr.

Bashir Mohamed Salih.

Ali Ibrahim Bashir.

Prizes were awarded as follows :—

Waterfield Prize in Surgery ... .. Ibrahim Mohd. El Maghraby.

Medicine Prize ... .. Ibrahim Mohd. El Maghraby.

## ATKEY PRIZE IN PUBLIC HEALTH.

A special fund was kindly subscribed to by Dr. O. F. H. Atkey for the purpose of providing a prize in Public Health at the end of 1934 and one at the end of 1935, the prizes to be competed for by the final year medical students together with the 3rd year sanitary students. The prize for 1934 was won by :—

Khalafalla Babikr (Sanitary Student).



## **MENTAL DISEASES.**

During the first term a course of lectures on Mental Diseases was given to the 4th year students by Dr. D. R. MacDonald. Graduates of the school were also invited to these special lectures and the large attendance was most gratifying.

## **SCHOOL LIBRARY.**

By the middle of 1934 the School Library had grown well beyond the needs of the medical students and it was decided to throw it open as a lending library for the use of medical practitioners throughout the Sudan. Catalogues were prepared and circulated to all members of the medical profession. Judging by the numerous and constant demands for books, the scheme appears to be of great service. The Library now contains about 1,000 volumes.

## **GENERAL.**

49 medical officers have passed out since the school opened. Of these one died and the remaining 48 are replacing satisfactorily 56 Syrian doctors. Owing to the fact that they require less leave and can take their leave at any time of the year, a smaller number are required as replacements. Retrenchment, and financial stringency hastened the replacement, and Sudanese medical officers are holding responsible posts in charge of the larger hospitals previously held by highly paid foreigners. It says much for their intelligence, efficiency and integrity that they have managed to take the place of the excellent type of Syrian doctor who served the country so well in the past.

**Sudanese Sanitary Officers.** The first two sanitary officers qualified at the end of the year.

The course is of three years duration, of which the first year is carried out with the first year medical students at the Kitchener School of Medicine.

It is expected that they will prove as valuable to the Sudan in their own way as their medical colleagues have proved.

**Graphic Museum.** The building is at present under construction and will be completed during the second half of 1935. The collection of specimens, photographs, and other material is well in hand.

**Assistant Medical Officers.**—10 passed out in 1934 and were posted to dispensaries.

**Laboratory Assistants**—5 passed out in 1934 and were posted to hospitals.

**Hospital Orderlies**—A small class for higher training in nursing and hospital routine, lasting six months, was organised this year in the Khartoum Civil Hospital.

**Various**—The apprentice under training in the X ray department was promoted Assistant Radiographer, and his place filled by a suitable candidate.

A museum attendant for the Graphic Museum is at present under training.



## WOMEN.

(a) **Midwives**—The School of Midwifery at Omdurman continues to carry out its excellent work.

23 pupil midwives were trained during the year, and passed out successfully.

The School was opened fourteen years ago, and 220 midwives have since been trained. Of these, 185 are still in practice. Their distribution is as follows:-

Berber Province	...	...	20	Kassala Province	...	...	10
Blue Nile	„	...	...	19	Khartoum	„	53
Darfur	„	...	...	7	Kordofan	„	22
Dongola	„	...	...	23	Port Sudan	„	2
Fung	„	...	...	5	Upper Nile	„	3
Halfa	„	...	...	10	White Nile	„	11

The district midwifery at Omdurman is entirely carried out by trained midwives, and the low maternal and infantile death rates show the result.

The inhabitants of the northern Sudan now recognise the advantages of a trained midwife, and as a result they are a powerful influence against dirt and undesirable tribal practices.

(b) **Nurses' Training School**—20 pupil nurses were under training during 1934, of whom 8 commenced the course in 1934 and 12 in 1933.

8 nurses passed the final examination in 1934 and were posted to various provincial hospitals.

# ANNUAL MEDICAL REPORT

## ON

### SUDAN DEFENCE FORCE

for the year 1934.

The admission rate shews a considerable increase over previous years, chiefly attributable to : an epidemic of mild smallpox which occurred in Wau (71 cases with no deaths) and which was carried by troops to Torit (10 cases with no deaths) ; mild epidemics of influenza in Kassala and Mongalla Provinces (135 cases with no deaths) ; an increase in the incidence of dracontiasis in Mongalla Province.

The death rate shews a slight decrease.

STRENGTH.	Total No. of Admissions.	Total No. of days Sickness.	Average days sick.	
			for whole Force.	for those sick.
4,715	4,219	48,278	10.24	11.44

The following table compares the sickness rates for the last ten years : —

YEAR		Average Annual Strength	Admissions	Average Constantly Sick	Ratio per 1000 of strength		Days lost through sickness	
					Admissions	Average Constantly sick	for whole force	for those sick
1925	...	12,320	7,232	246.23	587.01	19.98	7.29	12.42
1926	...	9,813	5,138	172.5	523.59	17.57	6.41	12.25
1927	...	8,809	5,396	149.36	612.55	16.95	6.18	10.1
1928	...	7,086	4,840	157.86	683.03	22.27	8.14	11.9
1929	...	7,024	4,916	145.2	699.88	20.67	7.54	10.78
1930	...	6,527	4,817	158.91	738.01	24.34	8.88	12.04
1931	...	5,333	4,194	96.65	786.42	18.11	6.61	8.41
1932	...	4,828	4,054	111.7	839.68	23.13	8.44	10.05
1933	...	4,919	4,097	120.5	832.89	24.49	8.94	10.73
1934	...	4,715	4,219	132.27	894.80	28.05	10.24	11.44

The principal causes of admission to hospital were :—

	Cases.
Malaria ... ..	1,185
Wounds and injuries ... ..	933
Venereal disease ... ..	640
Respiratory diseases ... ..	209
Influenza ... ..	157
Alimentary diseases ... ..	155
Guinea Worm ... ..	111
Amoebic Dysentery ... ..	100

Aweil and Khartoum shew the lowest sickness rate and Tali and Gedaref the highest.

16 deaths occurred during the year. This compares with previous years as follows :—

YEAR.	No. of deaths	Mortality rate per 1,000 of Troops.
1925 ... ..	65	5.27
1926 ... ..	48	4.89
1927 ... ..	30	3.40
1928 ... ..	60	8.46
1929 ... ..	30	4.27
1930 ... ..	44	6.74
1931 ... ..	11	2.06
1932 ... ..	16	3.31
1933 ... ..	19	3.86
1934 ... ..	16	3.39

Causes of death were as follows :—

Pulmonary Tuberculosis ... ..	1
Kala Azar ... ..	3
Pneumonia ... ..	3
Cerebrospinal Meningitis ... ..	3
Malaria ... ..	2
Septicaemia ... ..	1
Syphilis ... ..	1
Alimentary System ... ..	1
Circulatory System ... ..	1

### Malaria.

There were 45 more admissions for malaria this year as compared with 1933. The ratio per 1,000 of strength has increased from 231.77 to 272.5.

This increase is noted amongst troops stationed in Khartoum and Darfur, and is accounted for in the former case by fresh infections and relapses incurred on patrol work and in the latter by the exceptionally heavy rains.

As shown in the following table, there has been an appreciable decrease in all other stations :—

	Admissions per 1,000 of strength.	
	1933	1934
Khartoum ... ..	77.0	136.1
Camel Corps ... ..	298.8	258.1
Eastern Arab Corps ... ..	426.9	418.0
Western Arab Corps ... ..	117.8	305.4
Equatorial Corps ... ..	101.4	70.0



In the Eastern Arab Corps, the usual outbreak of malaria occurred after the rains. Admissions were approximately the same as last year.

					Gedaref	Kassala	Gallabat
1933	...	...	...	...	202	127	8
1934	...	...	...	...	202	120	12

Prophylactic quinine was not given in Kassala or Gedaref this year, but was given to the men at Gallabat.

The increase of admissions at Gedaref in November was due to the arrival of the Gallabat platoon. The exertion of the journey appeared to light up infections in about 70% of the strength.

The incidence of malaria among the civil population has been lower generally this year, throughout the Sudan.

In the absence of a reliable prophylactic drug, the most important measures are the protection of the individual from infection, and the thorough treatment of cases. The following table shows the admissions for malaria during the past ten years :—

YEAR.						Cases.	Ratio per 1,000 of strength.
1925	...	...	...	...	...	1,131	91.8
1926	...	...	...	...	...	932	94.97
1927	...	...	...	...	...	948	107.7
1928	...	...	...	...	...	698	98.5
1929	...	...	...	...	...	1,165	165.86
1930	...	...	...	...	...	706	108.16
1931	...	...	...	...	...	741	138.94
1932	...	...	...	...	...	810	167.7
1933	...	...	...	...	...	1,140	231.77
1934	...	...	...	...	...	1,185	272.5

**Venereal Diseases**—The following table shows a slight decrease in the admission rate for Arabs and a very marked improvement in that of the Equatorial Corps :—

YEAR.	ARABS.		EQUATORIAL.		
	Admissions.	Ratio per 1000 of strength.	Admissions.	Ratio per 1000 of strength.	
1925	...	1,283	125.12	110	78.68
1926	...	878	141.08	145	100.34
1927	...	742	115.76	39	28.55
1928	...	611	89.48	86	69.8
1929	...	646	114.09	80	58.73
1930	...	685	106.91	64	46.98
1931	...	594	135.4	49	51.81
1932	...	570	143.0	57	67.69
1933	...	595	145.44	52	62.8
1934	...	561	144.3	32	38.6

In Kordofan there were 148 admissions for venereal disease, as compared with 196 in 1933. It is believed that this improvement is due to the establishment of prophylactic treatment facilities, and to regular inspection.

In Gedaref an examination of all the men is made every two months. It is observed that many of the cases of gonorrhoea occur in a few men who have repeated attacks.

In November, at the last inspection, the incidence of gonorrhoea was 6.5% as compared with 6% in November, 1933.

#### **Bilharzia.**

25 cases came under treatment as compared with 20 last year. Of these 14 contracted the disease in the Nuba Mountains and 9 were from the Bahr el Ghazal Province.

#### **Pneumonia.**

45 cases with 3 deaths occurred as compared with 61 cases with 4 deaths in the previous year. The diminution of the incidence in the Western Arab Corps is very marked. 18 cases with one death occurring in 1934 as compared with 39 cases and 3 deaths in 1933.

The incidence in the Eastern Arab Corps shews a slight increase, and four cases occurred in Mongalla Province as a sequel to influenza.

#### **Dracontiasis.**

111 cases occurred in 1934 as against 41 in 1933. The increased incidence was confined to Torit where 69 cases were reported this year as against 4 in 1933.

#### **Kala Azar.**

11 cases with 3 deaths occurred as compared with 17 cases and 4 deaths in the previous year.

**Mongalla Province.** 7 cases occurred at Kapoeta and of these 4 were relapses. There were no deaths.

**Kassala Province.** The incidence shews a considerable reduction over the previous year, 3 cases with 2 deaths being reported as against 10 cases and 4 deaths.

In addition a soldier of the Eastern Arab Corps from Gedaref was admitted to the River Hospital Khartoum whilst on leave and died after he had been 39 days under treatment.

**Darfur Province.** No cases occurred among troops although 19 cases were reported in the civil population.

#### **Smallpox.**

The epidemic of smallpox which affected the Wau garrison was prevalent throughout the Bahr el Ghazal Province.

Vaccinations were carried out around the various stations but the disease itself was so mild that it provided a simpler and more efficient form of vaccination.







## STAFF & ORGANISATION.

### (A) BRITISH STAFF.

#### Administration.

**Director**—who is responsible for the medical and public health work carried out in the Sudan, and for the health of the Sudan Defence Force.

**Assistant Director and Medical Officer of Health**—who deals with public health questions at headquarters, and is responsible for the health of Khartoum.

**Senior Medical Inspector, Headquarters**—who deals with hospitals and other medical questions at headquarters.

Superintendent

Chief Storekeeper.

Chief Clerk.

Assistant Storekeeper.

Superintendent of Accounts.

#### Special Appointments.

Medical Specialist.

Surgical Specialist.

Ophthalmic Surgeon.

**Medical Registrar**—seconded to the Kitchener School of Medicine.

#### Medical Staff

33 Senior Medical Inspectors and Medical Inspectors. Matron, 4 Charge Sisters, and 10 Nursing Sisters. Radiographer.

#### Public Health Staff.

Assistant Medical Officer of Health, Khartoum.

15 British Sanitary Inspectors.

Inspectress of Midwives.

Matron, Midwifery Training School.

**(B) SYRIAN STAFF.**

14 **Medical Officers** who are gradually being replaced by Sudanese.

2 **Dispensers.**

**(C) SUDANESE STAFF.**

**Medical Staff**

48 **Medical Officers** who have been trained at the Kitchener School of Medicine.

**227 Assistant Medical Officers**—These are selected after several years' training as hospital orderlies, and given a course lasting one year. If they pass the requisite examination they are placed in charge of dispensaries.

**Hospital Orderlies.**

**Female Nurses.**

**Sanitary Barbers.**—These men receive a simple course of training in a hospital. They carry out simple treatment, inspect bodies, report epidemics, and carry out vaccinations. They work in outlying districts of the more sophisticated areas under the supervision of the nearest dispensary.

**Sheikhs' Dressers and Chiefs' Dressers.**—These men, who are selected by the Sheikh or Chief concerned from his tribe, carry out much the same functions as the sanitary barbers among the nomad Arabs of the north, and the pagan Negro tribes of the south.

**Laboratory Assistants.**—These are selected hospital orderlies who undergo a course of training at the Medical Research Laboratories in simple laboratory work. They are stationed in the larger hospitals or in quarantine stations.

**Public Health Staff.**

**Sanitary Officers** See page 36 and 79.

**Sanitary Overseers** See page 36.

**Subordinate Sanitary Staff-** House-to-house inspectors, mosquito-men etc.

**Midwives**—These are trained at the Midwifery School and practise under the supervision of the public health authorities. There are 185 at present in practice.

SUDAN MEDICAL SERVICE  
1934.

APPOINTMENT.	Establishment.
<b>Medical Staff.</b>	
Director ... ..	1
Assistant Director and Medical Officer of Health, Khartoum	1
Senior Physician ... ..	1
Senior Surgeon ... ..	1
Ophthalmic Surgeon ... ..	1
Senior Medical Inspectors	14
Medical Inspectors ... ..	22
Syrian Medical Officers	14
Sudanese Medical Officers	48
Assistant Medical Officers	227
Dispensers ... ..	2
Radiographers ... ..	1
Assistant Radiographers	2
Laboratory Assistants ... ..	4
<b>Midwifery Staff.</b>	
Inspectress of Midwives ... ..	1
Matron, Midwifery Training School	1
<b>Nursing Staff.</b>	
Matron ... ..	1
Charge Sisters ... ..	4
Nursing Sisters ... ..	10
<b>Sanitary Staff.</b>	
Chief Sanitary Inspector ... ..	1
Senior Sanitary Inspectors	9
Sanitary Inspectors ... ..	5
Sudanese Sanitary Overseers	11
<b>Clerical Staff.</b>	
Superintendent ... ..	1
British Clerks ... ..	1
Sudanese Clerks ... ..	56
Sudanese Clerk-Storekeepers	3
<b>Accountants.</b>	
Superintendent of Accounts	1
Sudanese Accountants ... ..	9
<b>Medical Stores Staff.</b>	
Chief Medical Storekeeper... ..	1
Assistant Medical Storekeepers	2
Storemen (Sudanese) ... ..	8
Tailors ... ..	1
Carpenters ... ..	1



# BRITISH MEDICAL STAFF SUDAN MEDICAL SERVICE.

ON 31.12.1934.

Director	...	...	...	Mr. E. D. Pridie, D.S.O., O.B.E., M.B., B.S.
Asst. Dir. & M.O.H., Khtm.				Mr. H. A. Crouch, O.B.E., M.C., M.R.C.S., L.R.C.P., D.P.H. (London)
Senior Physician	...	...	...	Dr. R. M. Humphreys, D.M., B.Ch.,
Senior Surgeon	...	...	...	Mr. F. S. Mayne, M.B., F.R.C.S.E.
Senior Medical Inspector	...	...	...	Lt.-Col. G. K. Maurice, D.S.O., M.C., M.R.C.S., L.R.C.P.
"	"	"	...	Dr. A. Cruickshank, M.D., B.Ch.
"	"	"	...	Mr. A. E. Lorenzen, M.R.C.S., L.R.C.P.
"	"	"	...	Mr. C. E. G. Beveridge, M.R.C.S., L.R.C.P.
"	"	"	...	Mr. F. E. Anderson, M.B., B.Ch.
"	"	"	...	Mr. F. H. Goss, M.C., M.B., B.Ch.
"	"	"	...	Mr. N. Macleod, M.B., Ch.B.
"	"	"	...	Dr. L. H. Henderson, M.D., Ch.B., D.T.M., & H.
"	"	"	...	Mr. J. S. Hovell, M.B., F.R.C.S.E.
"	"	"	...	Mr. D. R. Macdonald, M.B., Ch.B.
"	"	"	...	Mr. E. P. Pratt, M.B., B.S.
"	"	"	...	Mr. J. W. Wallace, M.B., B.Ch.
"	"	"	...	Mr. G. D. Rankin, M.B., B.Ch.
"	"	...	...	Mr. H. M. Elliott, B.Ch.
"	"	...	...	Mr. A. R. McKelvie, M.B., Ch.B.
Medical Inspector	...	...	...	Mr. J. Bryant, M.B., Ch.B., F.R.C.P.E., D.T.M. & H.
"	"	...	...	Mr. C. B. Drew, M.R.C.S., L.R.C.P.
"	"	...	...	Mr. J. S. Aldridge, M.R.C.S., L.R.C.P.
"	"	...	...	Mr. E. W. T. Morris, M.R.C.S., L.R.C.P.
"	"	...	...	Mr. H. M. Woodman, M.B., B.Ch.
"	"	...	...	Mr. A. P. Farmer, M.B., B.S., D.T.M. & H.
"	"	...	...	Dr. N. L. Corkill, M.M., M.D., Ch.B.
"	"	...	...	Mr. G. J. Clarke, M.R.C.S., L.R.C.P., D.T.M. & H.,
"	"	...	...	Mr. L. Brown, M.R.C.S., L.R.C.P.
"	"	...	...	Mr. R. McN. Buchanan, M.B., Ch.B., D.T.M. & H.
"	"	...	...	Mr. H. Richards, M.B., B.S., D.T.M. & H.
"	"	...	...	Mr. E. K. Malone, M.B., B.Ch., B.A.O.
"	"	...	...	Mr. J. L. D. Roy, M.B., Ch.B.
"	"	...	...	Mr. F. Bartholomew, M.R.C.S., L.R.C.P.
"	"	...	...	Mr. R. W. Stephenson, M.R.C.S., L.R.C.P.
"	"	...	...	Mr. F. L. Wheaton, M.B., B.S.
"	"	...	...	Mr. J. F. E. Bloss, M.R.C.S., L.R.C.P., D.T.M. & H.
"	"	...	...	Mr. W. H. Greany, M.B., B.Ch.
"	"	...	...	Mr. A. Royland Hunt, L.R.C.P., L.R.C.S. (Ed.).
"	"	...	...	Mr. G. C. Cochrane, M.R.C.S., L.R.C.P.
"	"	...	...	Mr. R. Kirk, M.B., Ch.B., F.R.F.P.S.G., D.P.H.
"	"	...	...	Mr. R. B. U. Somers, M.B., Ch.B., D.T.M. & H.

TABLE I.

SHOWS ADMISSIONS AND DEATHS BY DISEASES.

DISEASE.				TOTAL.							
				Europeans.				Natives.			
				Male.		Female.		Male.		Female.	
				A.	D.	A.	D.	A.	D.	A.	D.
Table "A"											
Tubercular											
1.	Disease of lung ...	...	...	2	—	2	—	440	65	113	16
2.	All other tubercular diseases ...			—	—	—	—	336	26	101	5
Venereal											
3.	Syphilis ...	...	...	1	—	—	—	6,017	27	4,256	10
4.	Gonorrhoea ...	...	...	5	—	—	—	1,711	3	381	—
5.	Soft Sore ...	...	...	—	—	—	—	466	—	15	—
Eye.											
6.	Trachoma...	...	...	—	—	1	—	571	—	250	—
7.	All other eye diseases ...	...	...	5	—	—	—	1,941	3	1,263	2
8.	Ear ...	...	...	3	1	—	—	210	1	91	1
9.	Skin ...	...	...	1	—	—	—	900	5	497	4
10.	Wounds and other injuries ...			59	1	7	—	13,465	167	3,921	57
Tumours.											
11.	Malignant ...	...	...	1	1	1	—	96	21	68	4
12.	Non-Malignant ...	...	...	1	—	3	—	284	1	172	5
Of Women.											
13.	Gynaecological ...	...	...	—	—	6	—	—	—	458	10
14.	Confinements ...	...	...	—	—	27	1	—	—	411	14
15.	Poisoning ...	...	...	1	—	—	—	62	5	30	7
Total Table "A" ...				79	3	47	1	26,499	324	12,027	135
Table "B" (Tropical).											
1.	Ancylostomiasis ...	...	...	—	—	—	—	576	13	190	4
2.	Bilharziasis ...	...	...	—	—	—	—	870	1	108	—
3.	Blackwater Fever ...	...	...	—	—	—	—	29	8	3	—
4.	Dysentery, Amoebic ...	...	...	10	1	5	—	1,910	42	653	11
5.	Dysentery, Bacillary ...	...	...	11	—	2	—	198	6	34	4
6.	Filariasis ...	...	...	—	—	—	—	90	1	10	—
7.	Madura disease ...	...	...	—	—	—	—	221	2	43	—
8.	Malaria ...	...	...	63	—	11	—	7,799	68	1,684	18
9.	Leishmaniasis (Kala-Azar) ...			—	—	—	—	220	42	69	4
10.	Trypanosomiasis...	...	...	—	—	—	—	4	—	2	—
11.	Yaws ...	...	...	—	—	—	—	677	1	532	4
12.	Sunstroke...	...	...	—	—	—	—	2	1	—	—
13.	Heatstroke ...	...	...	—	—	—	—	2	—	2	1
14.	Dracontiasis ...	...	...	—	—	—	—	552	—	117	—
15.	Tropical Ulcer ...	...	...	—	—	—	—	1,440	5	866	—
Total Table "B" ...				84	1	18	—	14,590	190	4,313	46

TABLE I. (Continued).

Disease.				TOTAL.							
				Europeans.				Natives.			
				Male.		Female.		Male.		Female.	
				A.	D.	A.	D.	A.	D.	A.	D.
Table " C " (Infective).											
1.	Anthrax	...	...	—	—	—	—	—	—	—	—
2.	Beri-beri	...	...	—	—	—	—	—	—	—	—
3.	Cerebrospinal—Meningitis	...	...	—	—	—	—	429	153	170	41
4.	Chicken Pox	...	...	—	—	—	—	522	—	18	—
5.	Cholera	...	...	—	—	—	—	—	—	—	—
6.	Dengue	...	...	—	—	—	—	—	—	—	—
7.	Diphtheria...	...	...	4	—	1	—	17	5	12	3
8.	Enteric (Including Paratyphoid)	...	...	4	—	2	—	146	20	36	2
9.	Erysipelas	...	...	—	—	—	—	8	—	3	1
10.	Gastro enteritis of children	...	...	2	—	—	—	29	8	27	5
11.	Influenza	...	...	15	—	—	—	1,786	9	400	4
12.	Leprosy	...	...	—	—	—	—	295	7	144	3
13.	Measles	...	...	—	—	2	—	631	12	186	11
14.	Mumps	...	...	—	—	—	—	78	1	11	—
15.	Pellagra	...	...	—	—	—	—	2	—	—	—
16.	Puerperal Fever	...	...	—	—	—	—	—	—	24	7
17.	Phlebotomus Fever	...	...	—	—	—	—	12	1	—	—
18.	Plague	...	...	—	—	—	—	—	—	—	—
19.	Pneumonia (Epidemic)	...	...	4	1	—	—	951	209	244	58
20.	Rabies *	...	...	—	—	—	—	28	2	13	4
21.	Relapsing Fever	...	...	—	—	—	—	1	—	—	—
22.	Rheumatic Fever	...	...	1	—	—	—	280	—	93	—
23.	Small Pox	...	...	1	1	—	—	172	—	24	—
24.	Tetanus	...	...	—	—	—	—	10	8	5	6
25.	Typhus	...	...	—	—	—	—	7	1	6	—
26.	Undulant Fever	...	...	—	—	—	—	45	8	6	—
27.	Whooping Cough	...	...	—	—	—	—	68	1	29	—
Total Table " C "				31	2	5	—	5,526	445	1,451	145
Table " D. "											
1.	Circulatory System	...	...	5	1	1	—	712	58	404	22
2.	Respiratory System	...	...	10	1	2	—	2,390	97	912	29
3.	Alimentary System	...	...	70	1	23	1	3,168	158	849	52
4.	Genito-Urinary System	...	...	14	—	2	—	2,080	71	577	13
5.	Nervous System	...	...	16	—	1	—	414	22	132	6
6.	Scurvy	...	...	—	—	—	—	51	3	1	—
7.	Diabetes	...	...	—	—	—	—	60	4	20	6
8.	Fever of uncertain origin	...	...	16	—	4	—	588	29	161	7
9.	All other diseases	...	...	13	—	2	—	5,481	28	3,141	20
Total Table " D "				144	3	35	1	14,944	470	6,197	155
" " " A "				79	3	47	1	26,499	324	12,027	135
" " " B "				84	1	18	—	14,590	190	4,313	46
" " " C "				31	2	5	—	5,526	445	1,451	145
Grand Total				338	9	105	2	61,559	1,429	23,988	481

\* Includes cases admitted for Anti-rabic treatment.



TABLE II.  
SHOWS ADMISSIONS AND DEATHS IN HOSPITAL DURING 1934.

	EUROPEAN.			NATIVE.		
	Adm.	Died	%	Adm.	Died.	%
<b>Bahr el Ghazal :—</b>						
Wau .. .. .	—	—	—	2,814	54	1.92
Rumbek ... ..	—	—	—	1,000	26	2.60
Aweil ... ..	—	—	—	426	2	0.47
Raga ... ..	—	—	—	514	2	0.39
Tonj .. .. .	—	—	—	468	1	0.21
Northern Dispensaries ...	—	—	—	2,095	—	—
Li Rangu ... ..	—	—	—	960	25	2.60
Tembura .. ..	—	—	—	946	29	3.06
Southern Dispensaries ..	—	—	—	3,600	—	—
<b>Berber Province :—</b>						
Atbara .. .. .	55	—	—	2,657	75	2.82
Shendi ... ..	—	—	—	904	9	1.00
Province Dispensaries ..	—	—	—	538	17	3.16
<b>Blue Nile Province :—</b>						
Wad Medani .. ..	88	—	—	3,384	176	5.20
„ „ Prison ... ..	—	—	—	373	5	1.34
Abu Usher .. ..	—	—	—	1,488	32	2.16
Sennar .. .. .	—	—	—	1,591	51	3.20
<b>Darfur Province :—</b>						
Fasher .. .. .	—	—	—	1,655	57	3.44
Geneina .. .. .	—	—	—	1,477	26	1.76
Nyala .. .. .	—	—	—	618	21	3.38
Zalingei ... ..	1	—	—	967	12	1.24
Province Dispensaries ..	—	—	—	3,149	13	0.41
<b>Dongola Province :—</b>						
Merowe .. .. .	—	—	—	979	30	3.06
Dongola .. .. .	—	—	—	689	22	3.19
<b>Fung Province :—</b>						
Singa .. .. .	—	—	—	1,005	46	4.57
Roseires .. .. .	2	—	—	868	34	3.92
Kurmok ... ..	—	—	—	376	5	1.33
Province Dispensaries ..	—	—	—	230	1	0.43
<b>Halfa Province :—</b>						
Wadi Halfa .. ..	1	—	—	1,451	32	2.20
<b>Kassala Province :—</b>						
Kassala .. .. .	5	1	20.00	2,038	87	4.26
Gedaref ... ..	—	—	—	1,439	74	5.14
Province Dispensaries ..	—	—	—	1,045	7	0.67

TABLE II—(Continued)

	EUROPEAN.			NATIVE.		
	Adm.	Died.	%	Adm.	Died.	%
<b>Khartoum Province :—</b>						
Khartoum .. ..	182	9	4.94	2,446	100	4.08
Omdurman .. ..	—	—	—	1,820	74	4.07
Khartoum North ..	—	—	—	10,40	3	0.29
Khartoum North Prison	—	—	—	264	2	0.76
River Hospital .. ..	3	—	—	1,338	9	0.67
Gebel Aulia .. ..	38	—	—	1,339	59	4.33
<b>Kordofan Province :—</b>						
Obeid .. ..	1	—	—	2,695	155	5.75
Nahud .. ..	1	—	—	1,195	55	4.60
Kadugli .. ..	—	—	—	1,417	20	1.41
Dilling .. ..	—	—	—	1,356	8	0.59
Talodi .. ..	—	—	—	1,499	7	0.46
Province Dispensaries ..	—	—	—	6,870	177	1.70
<b>Mongalla Province :—</b>						
Juba .. ..	5	—	—	3,277	37	1.13
Yei .. ..	—	—	—	404	14	3.46
Torit .. ..	—	—	—	1,100	9	0.82
Kiripi .. ..	—	—	—	832	4	0.48
Kapoeta .. ..	—	—	—	421	9	2.13
Meridi .. ..	—	—	—	929	8	0.86
Province Dispensaries ..	—	—	—	2,784	34	1.22
<b>Port Sudan and Suakin :—</b>						
Port Sudan .. ..	52	1	1.92	2,339	82	3.51
Port Sudan Prison ..	—	—	—	72	9	12.50
Suakin .. ..	—	—	—	80	4	5.00
Suakin Quarantine ..	—	—	—	9	2	22.22
<b>Upper Nile Province :—</b>						
Malakal .. ..	9	—	—	3,224	79	2.45
Province Dispensaries ..	—	—	—	3,179	—	—
<b>White Nile Province :—</b>						
Dueim .. ..	—	—	—	860	17	1.97
Kosti .. ..	—	—	—	1,014	22	2.16
<b>TOTAL .. ..</b>	<b>443</b>	<b>11</b>	<b>2.48</b>	<b>85,547</b>	<b>1,910</b>	<b>2.23</b>

Grand Total 85,990 admissions, with 1,921 deaths.

TABLE III.  
VACCINATION PERFORMED DURING THE YEAR 1934.

PROVINCE.	PRIMARY.			RE-VACCINATION.			TOTAL.
	Success.	Failed.	Ukn.	Success.	Failed.	Ukn.	
Bahr El ...							
Ghazal ...	12,142	—	51,093	—	—	—	63,235
Berber	2,572	2,163	2,009	—	—	—	6,744
Blue Nile	9,092	3,623	1,281	—	—	—	13,996
Darfur ...	504	41	17	—	—	—	562
Dongola ...	3,918	1,305	179	—	—	—	5,402
Fung ...	928	403	117	—	—	—	1,448
Halfa ...	467	164	4,471	—	—	—	5,102
Kassala ...	643	594	467	57	230	140	2,131
Khartoum	1,757	30	223	168	9	1,663	3,850
Kordofan ...	5,680	2,199	1,529	57	22	78	9,565
Mongalla ...	644	32	3,153	60	250	125	4,264
Port Sudan	441	130	606	—	—	—	1,177
Upper Nile	93	65	123	38	14	—	333
White Nile	1,460	625	6,064	—	—	—	8,149
TOTAL ...	40,341	11,374	71,332	380	525	2,006	125,958



TABLE IV.

SHOWS IN-PATIENTS, OUT-PATIENTS, ENDEMIC DISEASES AND OPERATIONS DURING 1933 AND 1934.

PROVINCE.	Hospitals	Dispensaries	In-patients.		Out-patients.		Bilharziasis.		Trachoma.		Ankylostomiasis.		Malaria.		Syphilis and Yaws.		Operations.	
			1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934
Bahr-el-Ghazal ...	4	30	8,153	12,823	364,595	478,471	65	332	295	868	97	972	690	1,010	19,115	7,057	1,128	1,163
Berber ...	2	23	3,233	4,154	544,376	627,686	794	1,025	27,601	19,000	61	23	24,327	18,980	2,457	2,569	616	747
Blue Nile ...	3	48	7,700	6,924	542,620	587,065	757	720	22,702	21,576	8	128	38,331	29,578	3,595	5,176	968	1,138
Darfur ...	3	19	7,364	7,867	279,959	259,492	1,020	672	3,147	5,838	4	629	1,435	2,586	17,224	11,293	475	564
Dongola ...	2	16	1,797	1,668	678,112	693,648	1,424	3,862	55,505	117,230	342	268	14,481	14,962	1,020	1,115	597	471
Fung ...	2	17	2,135	2,481	176,589	215,861	17	148	8,797	8,161	17	197	20,168	17,374	1,251	2,349	167	171
Halfa ...	1	7	930	1,452	107,672	161,322	1,050	3,713	14,579	19,273	132	252	2,974	4,628	260	247	78	223
Kassala ...	3	30	3,784	4,527	287,059	406,913	3	191	15,535	17,449	3	7	15,853	15,621	4,302	5,307	737	1,073
Khartoum ...	5	16	7,772	8,470	393,683	609,623	263	510	25,789	31,351	31	65	5,650	2,756	1,982	1,733	1,155	1,407
Kordofan ...	5	26	10,597	15,034	646,617	843,175	1,458	1,557	5,925	5,836	53	96	22,025	20,017	13,620	23,743	1,221	1,361
Mongalla ...	5	14	6,932	9,752	562,218	620,997	19	68	848	374	286	290	1,985	1,565	6,128	4,912	325	625
P. Sudan & Suakin...	2	3	2,252	2,552	93,900	105,313	65	103	3,184	3,189	—	7	111	118	614	997	485	450
Upper Nile ...	1	21	6,126	6,412	195,236	180,797	28	51	2,903	3,368	4	84	6,089	9,258	15,862	17,203	374	380
White Nile ...	2	15	1,540	1,874	220,363	248,834	1,573	1,122	9,087	9,101	—	278	7,777	7,524	3,818	5,552	283	309
TOTALS ...	40	285	70,315	85,990	5,092,999	6,039,197	8,536	14,074	195,897	262,614	1,038	3,296	161,896	145,977	91,248	89,253	8,609	10,082

TABLE V.  
LIST SHOWING HOSPITALS AND DISPENSARIES DURING 1934.

Hospitals and Dispensaries.	Beds equipped	Hospitals and Dispensaries.	Beds equipped	Hospitals and Dispensaries.	Beds equipped
<b>Bahr el Ghazal Province.</b>		<b>Blue Nile Province-<i>Ctbl.</i></b>		<b>Dongola Province. (Cont.)</b>	
Wau ... ..	200	Fahal ... ..	—	Debba ... ..	—
Li Rangu ... ..	100	Futais ... ..	—	El Seir ... ..	—
Rumbek ... ..	78	Gandal ... ..	—	Ghaba ... ..	—
Tembura ... ..	60	Ghubshan ... ..	—	Gureir ... ..	—
Aweil ... ..	17	Hamad El Nil ... ..	—	Haffir ... ..	—
Aluakiuak ... ..	—	Hilalia ... ..	—	Kareima ... ..	—
Badagbo ... ..	—	Hosh ... ..	—	Khandak ... ..	—
Bilal ... ..	—	Hag Abdalla ... ..	—	Korti ... ..	—
Falwall ... ..	—	Hassa Heissa ... ..	—	Kuddi ... ..	—
Gog ... ..	—	Istarihna ... ..	—	Kulgeili ... ..	—
Gogrial ... ..	—	Kab El Gidad ... ..	—	Lebab ... ..	—
Gangura ... ..	—	Kamlin ... ..	—	Mansurkotti ... ..	—
Ibba ... ..	—	Keteir ... ..	—	Nuri ... ..	—
Kashwal ... ..	—	Komor ... ..	—		
Lau ... ..	—	Laota ... ..	—	<b>Fung Province.</b>	
Luel ... ..	—	Managil ... ..	—	Singa ... ..	70
Madol ... ..	—	Managil Trav. Disp. ... ..	—	Roseires ... ..	60
Madragi ... ..	—	Mealig ... ..	—	Abu Hashim ... ..	4
Makpandu ... ..	—	Medina ... ..	—	Attib ... ..	—
Marial Bai ... ..	—	Meringan ... ..	—	Bardana ... ..	—
Meshra ... ..	—	Messalamia ... ..	—	Dar Agil ... ..	—
Migida ... ..	—	Nidiana ... ..	—	El Sukki ... ..	4
Ngindo ... ..	—	Radma ... ..	—	Gezzan and Fazogli ... ..	—
Nyin Akok ... ..	—	Remeitab ... ..	—	Gule ... ..	—
Pongo ... ..	—	Rufaa ... ..	—	Karkoj ... ..	5
Raga ... ..	15	Rufaa Trav. Disp. ... ..	—	Kurmok ... ..	32
Said Bundas ... ..	—	Sabi Deleib ... ..	—	Kurmok Trav. Disp. ... ..	—
Sopo ... ..	—	Seleima ... ..	—	Lokandi ... ..	—
Toinya ... ..	—	Shabarga ... ..	—	Maierno... ..	—
Tonj ... ..	—	Tabat ... ..	—	Ora ... ..	—
Wun Rog ... ..	—	Tayiba ... ..	—	Saoleil ... ..	—
Wun Shwai ... ..	—	Tebub ... ..	—	Suaada ... ..	—
Yambio ... ..	—	Turabi ... ..	—	Wad El Nail ... ..	—
		Um Degarsi ... ..	—	Wisko ... ..	8
		Wad El Ataia ... ..	—		
<b>Berber Province.</b>		Wad El Bur ... ..	—	<b>Halfa Province.</b>	
Atbara ... ..	150	Wad Hussein ... ..	—	Wadi Halfa ... ..	74
Shendi ... ..	60	Wad Medani Prison ... ..	—	Abri ... ..	—
Abidia ... ..	—	Wad Naaman ... ..	—	Akasha ... ..	—
Abu Hamed ... ..	6	Wad Rawa ... ..	—	Delgo ... ..	—
Aliab ... ..	—	Wad Saadalla ... ..	—	Dobeira ... ..	—
Atmoor ... ..	2	Wad Sulfab ... ..	—	Doushat ... ..	—
Berber ... ..	8			Fareig ... ..	—
Bouga ... ..	3	<b>Darfur Province.</b>		Sawarda ... ..	—
Darmali ... ..	—	El Fasher ... ..	129		
El Damer ... ..	—	Geneina... ..	35	<b>Kassala Province.</b>	
Eneibis ... ..	6	Nyala ... ..	48	Kassala ... ..	152
Gadalla ... ..	—	Abu Matarig ... ..	—	Gedaref (Civil) ... ..	60
Gananeita ... ..	—	Buram ... ..	—	Gedaref (Military) ... ..	26
Gandettu ... ..	—	Deleig ... ..	—	Abu Deleig ... ..	2
Gebelab... ..	—	Dereisa ... ..	—	Akik ... ..	—
Hilgi ... ..	—	Gorgor ... ..	—	Aroma ... ..	2
Kabushia ... ..	—	Id El Ghanam ... ..	—	Car Dispensary ... ..	—
Kitiab ... ..	2	Kas ... ..	—	Derudeib ... ..	4
Metemma ... ..	—	Kebkebia ... ..	1	Digein ... ..	—
Mograt Island ... ..	2	Kubbum ... ..	—	Doka ... ..	2
Monassir ... ..	—	Kuttum ... ..	2	Gallabat ... ..	8
Shereik ... ..	2	Meidob ... ..	—	Gebeit ... ..	13
Timberab ... ..	—	Mellit ... ..	—	Gebeit Mine ... ..	—
Wad Hamed ... ..	4	Mistiri ... ..	—	Goz Regab ... ..	2
Zeidab ... ..	2	Sirri ... ..	—	Goz Regab Trav. D. ... ..	—
		Taweisha ... ..	—	Galaat El Nahl ... ..	3
<b>Blue Nile Province.</b>		Um Buru ... ..	—	Hadaliya ... ..	—
Wad Medani ... ..	282	Um Keddada ... ..	—	Hawata ... ..	2
Sennar ... ..	126	Wadaa ... ..	—	Kassab ... ..	—
Abu Usher ... ..	96	Zalingei ... ..	18	Kassala Station ... ..	—
Abdel Galil ... ..	—			Khashm El Girba ... ..	2
Abdel Hakam ... ..	—	<b>Dongola Province.</b>		" " T. D. ... ..	—
Abdel Rahman ... ..	—	Merowe ... ..	75	Khatmia ... ..	—
Amara Kassir ... ..	—	Dongola ... ..	65	Mekali ... ..	—
Derwish ... ..	—	Argo ... ..	—	Metatib ... ..	—
Dolga ... ..	—	Badein ... ..	—	Mafaza ... ..	—
Efeina ... ..	—	Bilharzia Trav. D. ... ..	—	Musmar... ..	—
				Shalaa Tokar Delta ... ..	—



TABLE V, *Ctd.*

Hospitals and Dispensaries	Beds equipped	Hospitals and Dispensaries	Beds equipped	Hospitals and Dispensaries	Beds equipped
<b>Kassala Province (Cont.).</b>		<b>Kordofan Province (Cont.)</b>		<b>Upper Nile Province.</b>	
Shikeib Toker Delta ...	—	Ghulfan... ..	15	Malakal ... ..	250
Shawak ... ..	2	Heiban ... ..	15	Abwong ... ..	9
Sinkat ... ..	—	Katla ... ..	15	Akobo ... ..	9
Tendelai ... ..	—	Kauda ... ..	15	Bor ... ..	22
Tokar ... ..	18	Lagawa ... ..	6	Detwok ... ..	6
<b>Khartoum Province.</b>		Muglad ... ..	15	Doleib Hill ... ..	—
Khartoum ... ..	170	Rahad ... ..	7	Fungak ... ..	1
Khartoum North ...	35	Rashad ... ..	15	Gambeila ... ..	5
„ „ Prison ... ..	27	Shawai ... ..	10	Kaka ... ..	8
Omdurman ... ..	180	Sherkeila ... ..	—	Kodok ... ..	13
River Hospital ... ..	174	Soderi ... ..	—	Kongor ... ..	8
Gebel Aulia ... ..	92	Soderi Trav. Disp. ...	—	Lul Mission ... ..	—
Ailafoun ... ..	—	Sug El Gamal ... ..	4	Melut ... ..	6
Burri ... ..	—	Tabanya ... ..	—	Nasser ... ..	5
Deims ... ..	—	Tira Limon ... ..	5	Renk ... ..	9
Deim Saad ... ..	—	Um Ruaba ... ..	50	Rom ... ..	—
Geili ... ..	1	<b>Mongalla Province.</b>		Shambe ... ..	40
Gereif ... ..	—	Juba ... ..	140	S. S. Atbara ... ..	22
Gordon's Tree ... ..	—	Yei ... ..	30	S. S. Kerreri ... ..	3
Gordon College ... ..	—	Torit ... ..	66	Tonga ... ..	3
Kheleila ... ..	—	Kapoeta ... ..	53	Yirrol ... ..	18
Murada ... ..	—	Meridi ... ..	60	Yoynyang Mission ...	6
Omdurman Tech. Sch. ...	—	Aiyerri ... ..	5	<b>White Nile Province.</b>	
Seleitat ... ..	3	Idali ... ..	8	El Dueim ... ..	60
Serurab ... ..	—	Ikotos ... ..	19	Kosti ... ..	60
Tuti ... ..	—	Kajo Kaji ... ..	59	Aba Island ... ..	—
Wad Nubawi ... ..	—	Kirripi ... ..	11	Dar El Ahamda ... ..	—
<b>Kordofan Province.</b>		Koggi ... ..	5	Fashishoya ... ..	—
El Obeid ... ..	110	Kyala ... ..	7	Gebelein ... ..	—
Nahud ... ..	81	Lafone ... ..	—	Geteina ... ..	—
Kadugli... ..	100	Loka ... ..	6	Kawa ... ..	—
Dilling ... ..	100	Lyria ... ..	10	Shawal ... ..	—
Talodi ... ..	100	Opari ... ..	22	Shigeig ... ..	—
Abbassia ... ..	50	Pini ... ..	5	Tendelti ... ..	—
Abu Zabad ... ..	28	Taali ... ..	20	Turaa ... ..	—
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Buram ... ..	10	<b>Port Sudan and Suakin.</b>			
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# THE ANGLO EGYPTIAN SUDAN



Sudan Survey Dept. Khartoum, April 1928. (Topo. N° M. 414-28)  
 corrected Nov. 1929, 1930, 1931, 1932, Jan 1933

Scale 1:8,000,000  
 Miles 100 50 0 100 200 300 400 Miles

## Reference.

- RAILWAYS
- TELEGRAPHS OR TELEPHONES
- INTERNATIONAL BOUNDARIES
- PROVINCE BOUNDARIES
- WIRELESS STATIONS
- PROPOSED & EXISTING GINNERIES.
- MOTOR ROADS
- LANDING GROUND - IMPERIAL AIRWAYS
- OTHER PRINCIPAL LANDING GROUNDS

SLEEPING SICKNESS AREA SHADED IN RED  
 MONGALLA PROVINCE BOUNDARY PRIOR TO 1927



